User Manual

SG50KTL-M
PV Grid-Connected Inverter

SG50KTL-M-UEN-Ver20-201501 Version: 2.0

About This Manual

This manual is for the inverter SG50KTL-M. The inverter is grid-connected, transformer-less, robust and of high conversion efficiency. The device will bring you profit from PV power system.

Aim

The manual contains information about the inverter, providing you guidelines to connect the inverter into the PV power system and operate the inverter.

Related Documents

The manual cannot include complete information about the PV system. You will get the additional information about other devices at www.sungrowpower.com or via webpage of device manufacturer.

Target Group

The manual is targeted to technical personnel who is responsible for inverter installation and commissioning in the PV power system and inverter owner who will perform daily LCD operation.

How to Use This Manual

Read the manual and other related documents before any work with the inverter. Documents must be stored carefully and available at all times.

All rights reserved including the pictures, markings and symbols used. Any reproduction or disclosure, even partially, of the contents of this manual is strictly forbidden without prior written authorization of Sungrow.

The contents of the manual will be periodically updated or revised due to the product development. It is probably that there are changes of manual in subsequent inverter edition. The latest manual can be acquired via visiting the web page www.sungrowpower.com.

Symbols Explanation

Important instructions contained in this manual should be followed during installation, operation and maintenance of the inverter. And they will be highlighted by the following symbols.

DANGER

DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE indicates a situation which, if not avoided, could result in equipment or property damage.

NOTE indicates additional information, emphasized contents or tips to help you solve problems or save time.

Symbols on the Inverter Body

This symbol indicates that you should wait at least 10 minutes after disconnecting the inverter from the utility grid and from the PV input before touching any inner live parts.

Hot surface! In order to reduce the risk of burns, do not touch the hot surface when the device is running.

Look over the user manual before any operation on the inverter!

The installation and service of the inverter unit can only be performed by qualified personnel.

Do not disconnect DC connectors from the unit under load!

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1 Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS

The SG50KTL-M has been designed and tested strictly according to the international safety regulations. As electrical and electronic equipment, safety instructions related to them must be complied with during installation, commissioning, operation and maintenance. Incorrect operation or work may result in damage to:

- The life and well-being of the operator or a third party
- The inverter and other properties that belong to the operator or a third party

Therefore, the following safety instructions must be read and always kept in mind prior to any work. All detailed work-related safety warnings and notes will be specified at the critical points in corresponding chapter.

⚠ WARNING

All installation and electrical work must only be performed by qualified personnel. They have

- **been trained specially;**
- **already completely read through and understood the manual and other related documents;**
- **been familiar with safety requirements for electrical system.**

Technical personnel mentioned above may perform the following work:

- Install the inverter onto the wall
- Connect the inverter into the PV power system
- Connect other devices into the PV power system
- Commission the inverter
- Maintain and service the inverter

Before Installation

CAUTION

There is a risk of injury due to improperly handling the device!

- **Always follow the instructions contained in the manual when moving and positioning the inverter.**
- **The weight of the equipment can cause injuries, serious wounds, or bruise if improperly handled.**

During Installation

Prior to installing the inverter onto the wall, it is crucial to make certain that the inverter is not electrically connected.

DANGER

Prior to installing the inverter onto the wall, it is crucial to make certain that the inverter is not electrically connected.

CAUTION

System performance loss due to bad ventilation!

The equipment requires good quality ventilation during operation. It is essential to keep the unit upright and nothing covering the heat sink in order to ensure that the equipment interior is well cooled down.

During Electrical Connection

DANGER

Lethal voltage exists!

PV arrays will produce electrical energy when exposed to sunlight and thus can create an electrical shock hazard.

- **Wiring of the PV arrays should only be performed by qualified personnel.**
- **PV modules should be covered by opaque materials during wiring.**

⚠ WARNING

All cables must be firmly attached, undamaged, properly insulated and adequately dimensioned.

During Inverter Operation

Do not open the enclosure when the inverter is under voltage. There is an unlikely but possible risk of explosion in very specific cases of fault. The housing will protect persons and property from such an explosion, only if it is correctly sealed.

⚠ DANGER

There is a risk of inverter damage or personal injury!

Do not disconnect DC connectors while the inverter is under AC load! First de-energize the equipment from dual power sources and then verify that there is no voltage present.

⚠ CAUTION

There is a risk of burn!

Prevent from touching device hot parts (such as heat sink) during operation. Only LCD display panel and DC switch can be touched during inverter operation.

Maintenance and Service

⚠ DANGER

There is a risk of inverter damage or personnel injury due to incorrect service work!

Always keep in mind that the inverter is power supplied by dual power source: PV arrays and utility grid.

Before any service work, you should obey the following procedures.

- **Disconnect inverter from the utility grid side first and then PV arrays;**
- **Wait at least ten minutes until the inner capacitors discharge completely;**
- **Verify that no voltage or current present with appropriate testing device.**

⚠ CAUTION

Keep unrelated person away!

A temporary warning sign and barrier must be posted to keep non-related person away while performing electrical connection and service work.

NOTICE

- **Any fault that may impair the inverter safety functions must be repaired immediately before the inverter is restarted.**
- **Inverter contains no owner serviceable parts inside. Please contact local authorized personnel if any service work is required.**

Servicing of the device in accordance with the manual should never be undertaken in the absence of proper tools, test equipment or more recent revision of the manual which is clearly and thoroughly understood.

NOTICE

There is a risk of inverter damage if it is improperly serviced.

Use only accessories and spare parts approved by the inverter manufacturer. Never modify the inverter or the components of the inverter. Otherwise it may void any or all warranty rights from Sungrow.

NOTICE

There is a risk of inverter damage due to electrostatic discharge!

The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Avoid unnecessary touch with the boards during replacement.

Others

NOTICE

The selected country settings can be changed by qualified personnel only!

Unauthorized modification of country settings is prohibited. Alternation of the country settings may cause a breach to the type-certificate marking.

WARNING

All safety instructions, warning labels and nameplate on the inverter body:

- **Must be clearly visible;**
- **Must not be removed, covered and pasted.**

WARNING

These regulations should also be followed:

- **The regulations related to the electricity fed into grid;**
- **The safety instructions related to PV arrays;**
- **The safety instructions related to other electrical device.**

2 Product Introduction

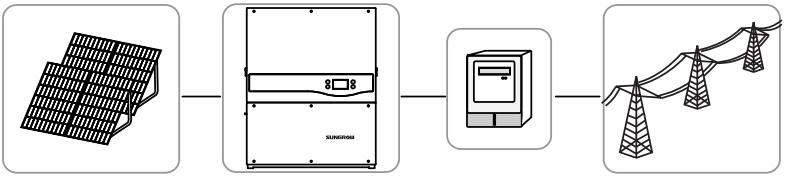
2.1 Intended Usage

SG50KTL-M (It will be referred to as inverter hereinafter unless otherwise specified) which is a 3-phase string inverter without transformer, is a crucial unit between the PV strings and utility grid in the PV power system.

Inverter is dedicated to converting direct current power generated by the PV modules into alternating current, which conforms to parameters of local utility grid, and feeds it into the utility grid. The intended usage of the inverter is illustrated in Fig. 2-1.

WARNING

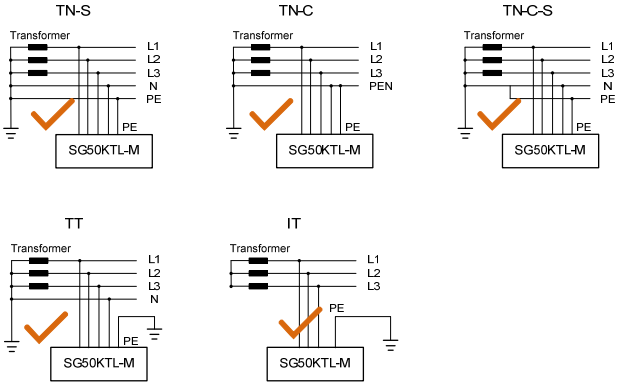
Inverter CANNOT be connected to the PV modules, the positive or negative terminal of which needs to be grounded.



A B C D

Fig. 2-1 Application of the inverter of the PV Power System

Item	Description	Note
A	PV strings	Monocrystalline silicon; polycrystalline silicon and thin-film without grounding of protection class II
B	Inverter	SG50KTL-M
C	Metering device	meter cupboard with power distribution system
D	Utility grid	TT, TN-C, TN-S, TN-C-S , IT



If the PV system exceeds the capacity of one inverter, it is possible to connect several inverters into the PV system, with each one connected to an appropriate section of PV inputs and on the AC side they connected in parallel to the grid.

NOTICE

Any other or additional usage is not permitted except the intended usage.

Inverter may only accept PV modules with Protection Class II as its input.

Inverter may only be connected to utility grid via distribution board. Local loads (home appliance, lights, motor loads, etc.) cannot be connected between inverter and AC circuit breaker on the distribution board.

Additionally, the unit is intended for fixed installation. Located on a part that is not removable without impairing the operation of the unit.

2.2 Product Description

2.2.1 Product Appearance

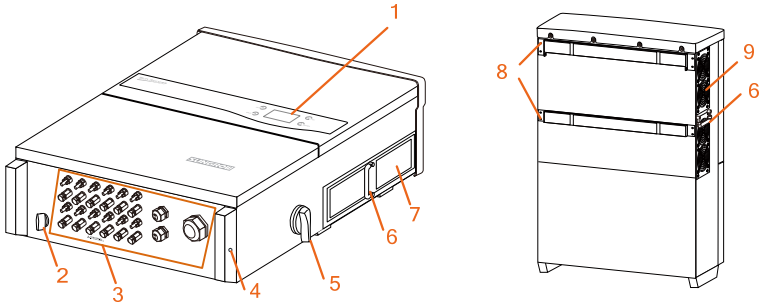


Fig. 2-2 Product Components Description

*Image shown here is for reference only. Actual product you receive may differ.

Item	Name	Description
1	LCD display panel	Inverter operation data viewing and parameters configuration can be performed via the LCD display panel.
2	DC switch	During normal operation it is in "ON" state. It can shut down the inverter immediately in "OFF" position.
3	Connection terminals	They are DC input terminals, AC output terminal and RS485 communication terminal.
4	Second PE Terminals	Second protective earth terminals as specified in EN 50178.
5	AC switch(optional)	Serviced as an automatic overcurrent device.
6	Handles	The handles are designed for holding the unit when transporting, installing or servicing.
7	Air outlet	Exit of hot air during the inverter operation.
8	Mounting ear	It is used for hanging inverter onto the backplate.
9	Fans	There are four fans to perform controlled forced-air cooling.

2.2.2 Dimensions of Inverter

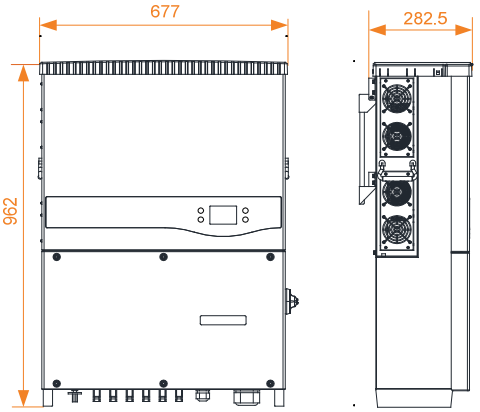


Fig. 2-3 Outline Dimensions of Inverter (unit: mm)

2.2.3 LCD Display Panel

As a human-computer interaction interface, LCD display panel comprises LED indicators, buttons and LCD display screen on the front panel of the inverter.

- LEDs indicate the working status of the inverter
- The current running information shown on the LCD display
- Fault records shown on the LCD display
- Inverter configuration by pressing the buttons

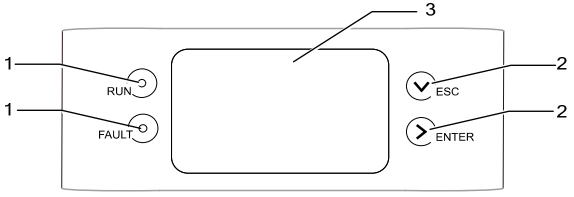


Fig. 2-4 LCD Display Panel

Tab. 2-1 LCD Display Panel Description

No.	Name	Description
1	LED indicators	"RUN" and "FAULT". Inverter current state can be known from the two indicators. Detailed definition is shown in Tab. 2-2.
2	Buttons	Navigate in the LCD menu, set values and so on. Detailed function is shown in "Tab. 10-1".

No.	Name	Description
3	LCD screen	LCD screen can display current state of inverter, current running information, history information and parameters to be set.

Tab. 2-2 Description of LED Indicator Status

LED Status	Description
"RUN": on; "FAULT": off	Inverter is feeding AC power to the utility grid.
"RUN": off; "FAULT": on	A fault happens; or protection function triggers.
"RUN": off; "FAULT": off	Inverter is not energized; or there is a communication error between DSP and LCD.
"RUN": Flicker "FAULT": OFF	Warning information occurs to the inverter.

2.2.4 DC Switch

DC switch is designed for safely disconnecting the DC input current if required.

The inverter works automatically when input and output meet the requirements. Rotating DC switch to the "OFF" position will immediately cut off the flow of DC current.

Rotate the DC switch to the "ON" position, before restarting the inverter.

2.3 Technical Description

2.3.1 Principle Description

PV strings input voltage is transmitted to DC BUS via Boost circuit.

The SG50KTL-M is equipped with MPPTs for four DC inputs to ensure that the maximum power can be utilized even in different PV modules installation conditions.

Inversion circuit converts DC power into AC power, which will be fed into the utility grid via five core terminals. Protective circuits are designed to guarantee inverter safe operation and human safety.

DC switch is integrated for safe disconnection of DC current. The inverter provides standard interface RS485 for communication. Inverters are also provided running records display and parameters configuration via human-computer interface– LCD display panel.

We provide 2 options of inverters for the users, S1 is the deluxe version, S2 is the standard version, the principle design is illustrated below:

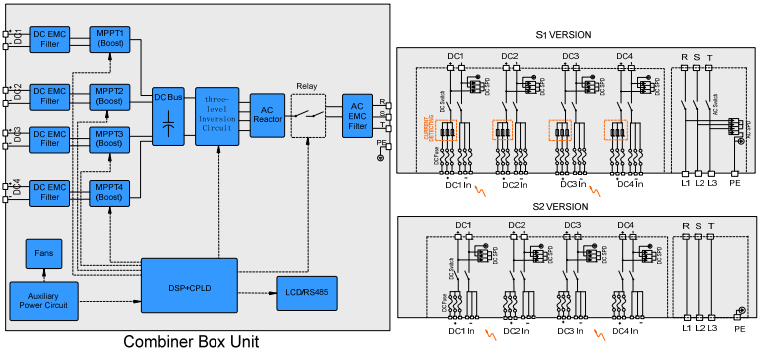


Fig. 2-5 Main Circuit Diagram of SG50KTL-M

2.3.2 Functions Description

Inverter functions can be grouped as the following:

- Conversion function

  Inverter converts the direct current power into alternating current power, which conforms to the grid requirement of its installation country.

- Data storage and display

  Inverter stores essential data including running information and fault records, and displays them on integrated LCD display.

- Parameters configuration

  Inverter provides various parameters configuration for optimal operation.

- Communication interface

  Standard RS485 interface for connecting other monitoring devices into the PV system is included.

- Protection functions
  - Short circuit protection
  - Insulation resistance to ground surveillance
  - Inverter output voltage surveillance
  - Inverter output frequency surveillance
  - Residual current protection
  - DC component of AC output current surveillance
  - Anti-islanding phenomena protection

- Ambient temperature surveillance
- DC over-voltage protection
- Over current protection
- Power module over-temperature protection

2.3.3 Derating

Derating the output power is a way to protect the inverter from overload and potential faults. Inverter's derating function can be activated in the following scenarios:

- Grid voltage too low
- Temperature too high (Inner temperature and power modules temperature)
- Power limit setting on the inverter LCD display or remote dispatch
- Grid frequency too high (when the Country selection is "DE" or "IT")

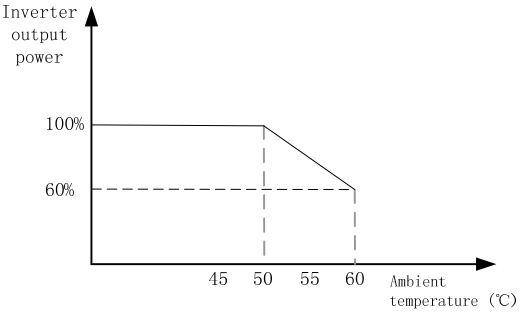
Power Limit Setting

User may allocate output power value of the inverter via LCD control panel or the remote dispatch from the grid company. Under this kind of power derating, the operating states will display on the LCD screen.

Over-temperature Derating

Power modules over-temperature may result from high ambient temperature, poor ventilation or fault of fans. Over-temperature derating may protect the inverter as well as the power modules against damage.

- When the modules temperature exceeds an upper limit, the inverter start to gradually derating until the temperature decreases to normal range.
- When the inner temperature exceeds an upper limit, the inverter start to gradually derating until the temperature decreases to normal range.



Lower limit of the over-temperature derating: 60% of the nominal power.

If the modules temperature and the inner temperature are both exceed the limit, the actual derating power value will be the less one.

Grid Under-voltage Derating

Once the grid voltage is in the defined range of Vgrid(Vmin…215V), the inverter will decrease the power output.

$$P_{[Vmin…266V]} = Pn \times (Vgrid / 230V)$$

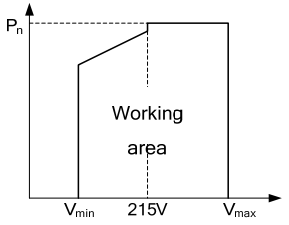


Fig. 2-6 Grid Under-voltage Derating

3 Installation Flow

Fig. 3-1 shows the installation flow of inverter. Please follow these procedures when installing the inverter.

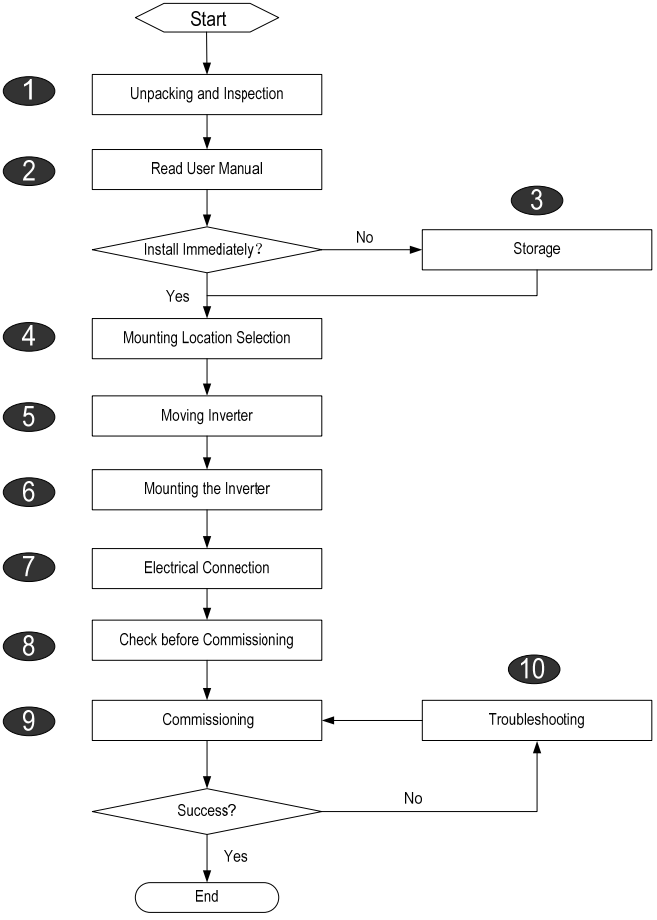


Fig. 3-1 Installation Flow Chart

Tab. 3-1 Description of Installation Flow

Order	Description	Reference Chapter
1	Unpacking and inspection	Section 4.1
2	Read this manual, especially the section on "safety instruction"	Chapter 1
3	Store the inverter unit if not install immediately	Section 4.4
4	Choose the best installation site	Section 5.1
5	Moving the inverter to installation site	Section 5.2
6	Install the inverter against the chosen wall	Section 5.3
7	Electrical connections include DC, AC, ground and communication(optional)connection	Section 6.3...6.7
8	Examine before commissioning	Section 7.1
9	Start up inverter and configure corresponding parameters	Section 7.2
10	Troubleshooting	Section 9.1

4 Unpacking and Storage

4.1 Unpacking and Inspection

The unit is thoroughly tested and strictly inspected before delivery. Damage may still occur during shipping.

- Check the packing for any visible damage upon receiving.
- Check the inner contents for damage after unpacking.
- Check the completeness of delivery contents according to the inner packing list.

If there is visible damage to the packaging or the inner contents, or if there is something missing, contact the unit dealer.

Do not dispose of the original packaging. It will be the best choice to store the inverter by re-using the original packaging.

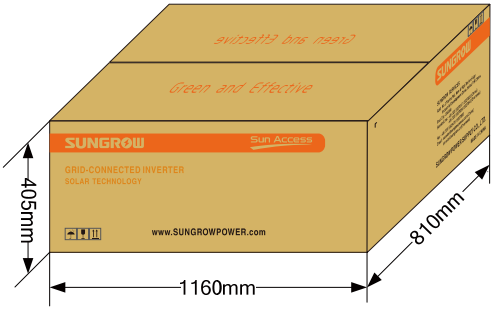


Fig. 4-1 Paper Packaging of Inverter

4.2 Identifying Inverter

A nameplate is attached to one side of the inverter and the carton respectively. It provides information on type of inverter, along with the most important specifications, marks of certification institutions, website and serial number which is available and identified by Sungrow.

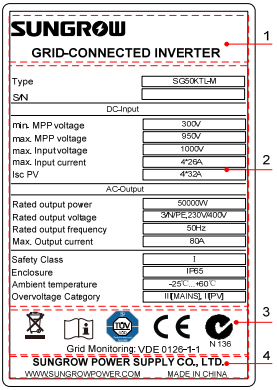


Fig. 4-2 Nameplate of Inverters

*Image shown here is for reference only. Actual product you receive may differ.

Item	Description
1	SUNGROW logo and product type
2	Technical data of inverter
3	Marks of certification institutions of inverter
4	Company name, website and origin

Tab. 4-1 Description of Icons on the Nameplate

Icon	Description
	Don't dispose of the inverter with the household waste.
	Refer to the corresponding instructions.
	TUV mark of conformity. The inverter is in compliance with directives of TUV.
	CE mark of conformity. The inverter is in compliance with directives of CE.
	C-tick mark of conformity. The inverter is in compliance with directives of C-tick.

4.3 Delivery Contents

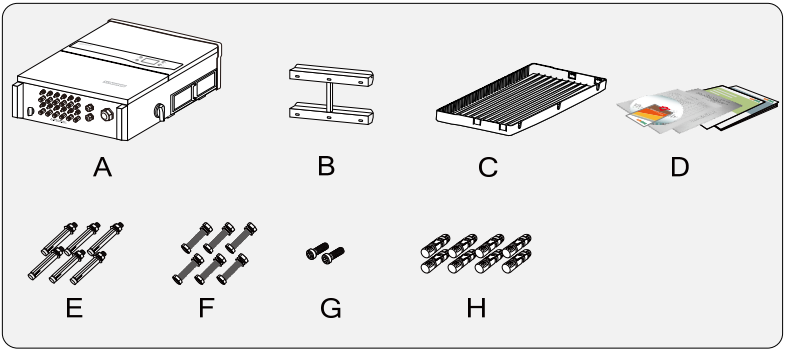


Fig. 4-3 Delivery Contents

*Images shown here is for reference only! Actual product you receive may differ.

Item	Name	Description
A	Inverter unit	---
B	Backplate	It is used for mounting inverter onto the wall.
C	Inverter cap	It is for inverter's better weather-proof function.
D	Documents	Documents include quality certificate, packing list, product test report, and quick user manual.
E	Expansion bolts	Six units. It is used for fastening backplate onto concrete wall.
F	Fastener set	Six units. It is used for fastening backplate onto metal frame.
G	Fix screws	2 M4×16 screws for fix the inverter to the backplate.
H	DC connectors	Eight pairs. PV input cables must be equipped with the connector.

4.4 Storage of Inverter

Where the inverter may not be installed immediately or inverter needs to be stored under certain condition, store the unit as the following indications:

- The unit must be packed into original carton and desiccant must be put inside. If the original packaging is not available, an equivalent carton which is able to support the unit weight and size can be used.
- The packing should be sealed by adhesive tape.

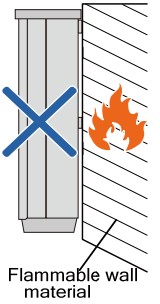
- The unit must be stored in a clean and dry place to protect against dust and moisture.
- Relative temperature: -30℃…85℃; Relative humidity: 0-100%.
- If one inverter is stacked on top of the other inverter, the max. stack layer should be less than three.
- It is very important to keep the packing away from chemicals. Otherwise it will lead to corrosion.
- During the storage time, periodically check any visible damage by rats and other rodents. Replace the packaging if necessary.
- The packaging should be kept upright.
- After long term storage, local installer or service dept. of Sungrow should perform a comprehensive test before connecting the inverter into PV power system.

5 Installing Inverter onto Wall

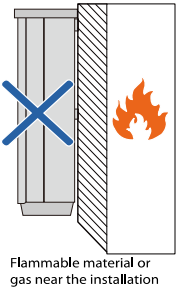
5.1 Selecting Installation Location

Selecting an optimal installation location for the inverter is decisive for its operating safety as well as its expected efficiency and service life.

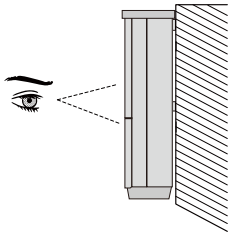
- Take the load capacity of the wall into account. The wall (such as concrete wall and metal structure) should be strong enough to hold the weight of the inverter over a long period of time.
- Install the unit where is accessible to install, electrical connect or service.
- Do not install the unit on the wall of flammable materials.



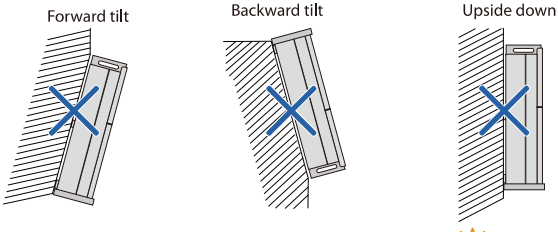
- Do not install the inverter where contains flammable materials or flammable gas in the vicinity of the unit installation.



- Install the unit at eye level for easily buttons operation and display read.



- Never install the inverter horizontally, nor with a forward tilt, nor with a backward tilt nor even with upside down.



- The inverter unit with IP65 can be installed indoors or outdoors also.

Max. ambient temperature: +60°C

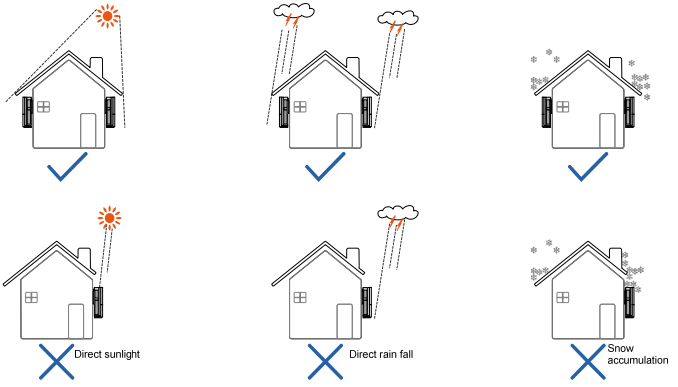
- The ambient temperature should range from -25°C to 60°C.

Min. ambient temperature: -25°C

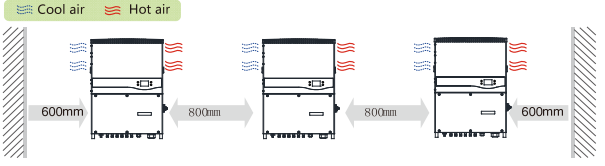
- The relative humidity range of the installation site is 0-100%.

Max. relative humidity: +100%

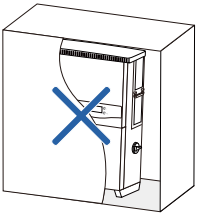
- Avoid exposing inverter to direct sunlight or rain or snow to extend its service life despite the IP65 protection degree. Exposure to the sun may cause additional internal heating which will cause power reducing. Shaded site of the building is preferred.



- Take enough space for convection into consideration during installing multiple inverters. It is suggested that position the multiple inverters in a staggered way if necessary.



- Do not install the inverter in a closed cabinet. Otherwise, the inverter will not operate normally. It is necessary to make sure that hot air will be discharged by forced ventilation.
- Do not install the inverter where children can reach.
- Do not install the inverter in living area. Noise can be produced during running of inverter, which may affect your daily life.



5.2 Moving Inverter to Installation Site

If the inverter is to be installed, remove the unit from the packaging and move it to the chosen installation site. During the moving process, the following instructions should be obeyed.

- Always remember the weight of the inverters.
- Grasp the equipment handles by both hands by means of handles.
- Move the unit with the help of others or the lifting device.
- Do not release the equipment unless it has been secured to the wall firmly.

5.3 Installing the Inverter

Inverter is installed onto the wall by means of backplate enclosed in the packaging. If you don't use the supplied backplate, you may drill holes refer to its dimension below.

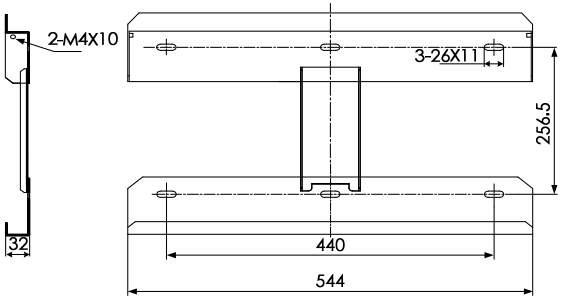


Fig. 5-1 Dimensions of Backplate(unit: mm)

There are two sets of stainless fasteners supplied for attaching the backplate to concrete wall and metal frame.

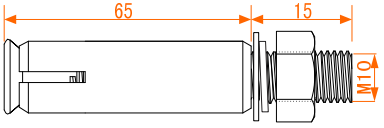


Fig. 5-2 Dimensions of Expansion Bolt Set for Concrete Wall (unit: mm)

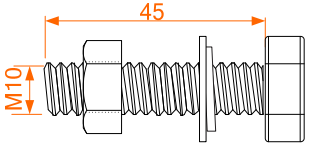


Fig. 5-3 Dimensions of Fastener Set for Metal Frame(unit: mm)

5.3.1 Installing on Concrete Wall

Step 1 Remove backplate and fasteners from the packaging.

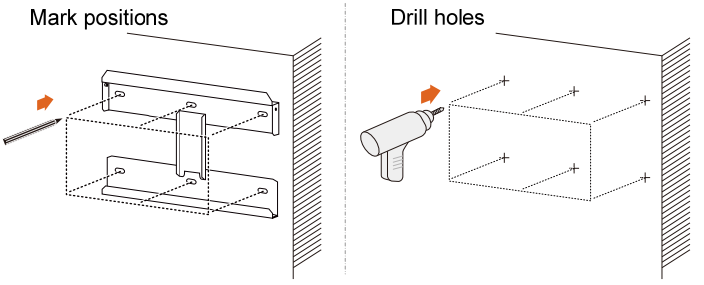
Step 2 Place the backplate onto the chosen concrete wall and adjust it until it is in a horizontal position.

Step 3 Mark the positions to drill holes using the backplate as the template.

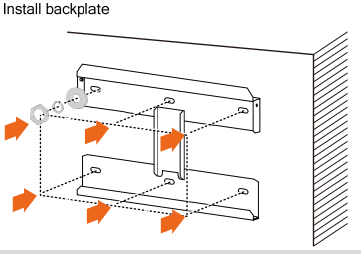
Step 4 Drill holes according to the marks made before.

DANGER

In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.



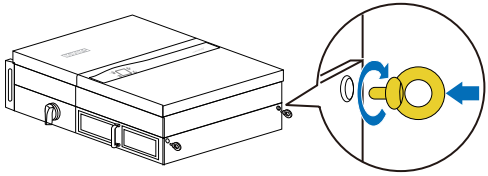
Step 5 Attach the backplate to the wall firmly with the supplied expansion bolt set. The torque for fastening the nut is 35 Nm.



- If the installation location is lower, the inverter can be directly linked to the backplate, please follow step 6 and then jump to Step 10.
- If the installation location is higher, the inverter can not be directly linked to the backplate, please perform steps 7 to 11.

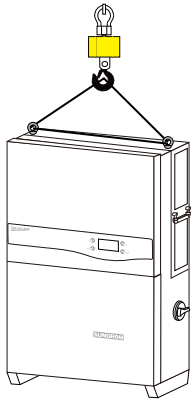
Step 6 Lift up inverter above the backplate and then slide down to make sure that the recesses on the back of the inverter fit perfectly together with the backplate.

Step 7 Screw two M12-screwed lifting rings to the screw holes on top of the inverter.



M12-screwed lifting ring is a standard component. It is not within the scope of delivery. Please purchase from the market if needed.

Step 8 Lead the rope (with sufficient load-carrying capacity) prepared beforehand through the two lifting rings to lift the inverter. Inverter is lifted to the level of the fixed backplate or adjacent place.



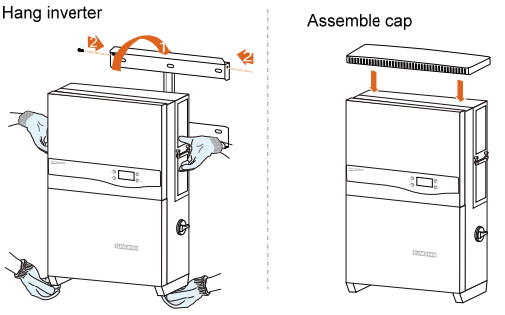
NOTICE

Please keep the inverter balance during the whole process of inverter lifting. Inverter may hit the wall or other obstacles if otherwise.

Step 9 Fit the inverter to the backplate, refer to step 6.

Step 10 After fit the inverter to the backplate, fasten the inverter to the backplate with two M4×16 screws.

Step 11 Assemble the cap onto the inverter for better weatherproof function.



5.3.2 Installing on Metal Frame

Step 1 Remove backplate and fasteners from the packaging.

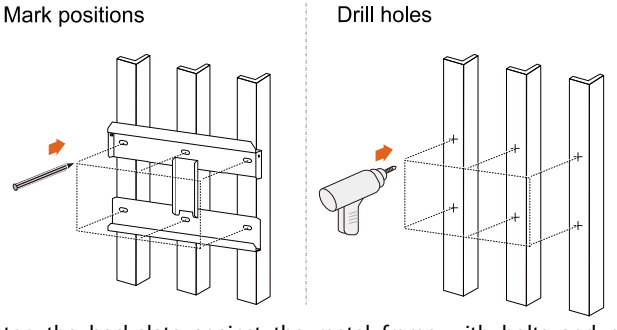
Step 2 Choose the best installation site according to above requirements. Place the backplate onto the chosen metal frame and adjust it until it is in a horizontal position.

Step 3 Mark the positions to drill holes by using the backplate as the template.

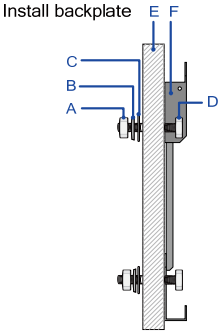
Step 4 Drill 6 holes at the marks you have made. If the shape of the metal frame doesn't fit the holes on the backplate, re-drill holes on the backplate of appropriate position according to the chosen frame.

DANGER

In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.



Step 5 Fasten the backplate against the metal frame with bolts and nuts. The dimensions of fasteners used in the following diagram are recommended. The torque for fastening the nut is 35 Nm.

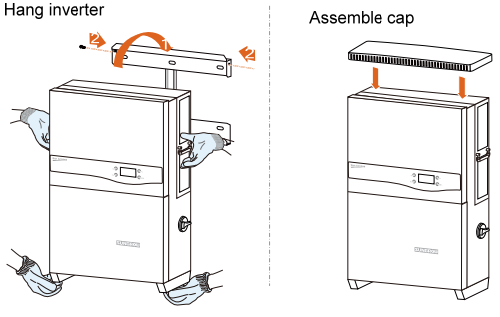


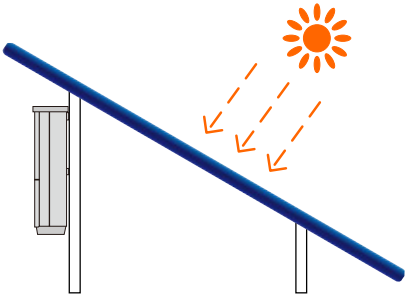
Item	Description	Remark
A	Hexagonal socket nut	M10
B	Spring washer	-
C	Washer	-
D	Hexagonal bolt	M10*45
E	Metallic wall	-
F	Backplate	-

Step 6 Lift up the inverter above the backplate and then slide down to make sure that the recesses on the back of the inverter fit perfectly together with the backplate.

Step 7 After fit the inverter to the backplate, fasten the inverter to the backplate with two M4×16 screws.

Step 8 Assemble the cap onto the inverter for better weatherproof function.





6 Electrical Connection

Once the inverter is firmly attached to the appropriate location, it can be connected to the PV power system.

Installation shall comply with local regulations and technical rules. Installation shall comply with the relevant instructions of AS 4777.1. All electrical connection should follow the National Wiring Rules of Standard AS/NZS 3000.

⚠ WARNING

Improper operation during the wiring process can cause fatal injury to the operator or unrecoverable damage to the inverter.

Only qualified personnel can perform the wiring work.

Prior to any electrical connection, keep in mind that inverter has dual power supplies. It is mandatory for technical personnel to wear personal protective equipment: helmet, footwear and gloves during the electrical work.

6.1 Terminals Description

All electrical terminals and cable openings of the inverter are located at the connection cabinet as Fig. 6-1.

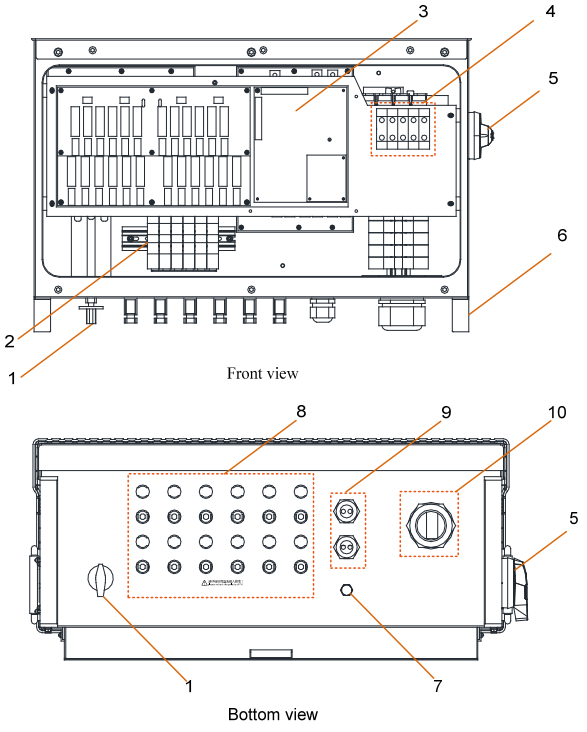


Fig. 6-1 Connection Cabinet Description

*Image shown here is for reference only. Actual product you receive may differ.

No.	Description	No.	Description
1	DC switch	6	Second PE terminal
2	Plinth of DC SPDs (Surge Protection Devices)	7	Waterproof air valve
3	Configuration circuit board	8	PV input terminals
4	AC connection terminal block	9	Communication cable glands
5	AC switch	10	AC cable gland

6.2 Connecting Inverter to AC Grid

6.2.1 AC Side Requirements

Only after receiving prior approval from the local grid company as required, should you connect the inverter to the grid.

Prior to connecting to the utility grid, verify whether the grid voltage and frequency are within the range of inverter output parameters, referred to "Appendix". Otherwise consult local grid company for solution.

AC Side Circuit Breaker

An independent three or four-pole circuit breaker (minimum size value 50A) for each inverter must be installed at the output side to ensure that the inverter can be securely disconnected.

NOTICE

- **It is not allowed for several inverters to use the same circuit breaker.**
- **It is not allowed to connect loads between inverter and circuit breaker.**

Residual Current Device

With an integrated universal current-sensitive residual current monitoring unit inside, the inverter is able to distinguish the fault currents from normal capacitive leakage currents. The inverter will disconnect from mains as soon as a fault current of more than limit value has been detected.

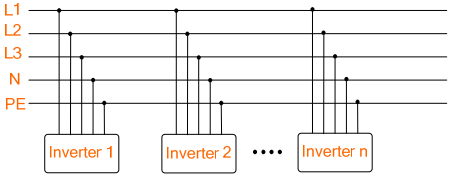
However if an external RCD or residual current breaker is mandatory, the switch must trigger at a failure current of 300mA or higher.

Requirements of Multiple Inverters in Parallel Grid Connection

If several inverters are operated in parallel connection to grid, different requirements should be obeyed.

Scenario 1:

Several inverters are operated in parallel connection to the three-phase Low Voltage grid.



Requirements:

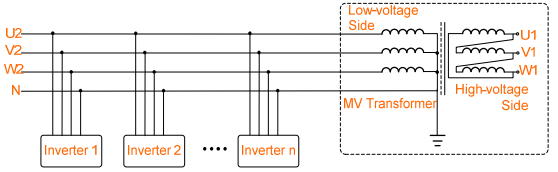
Please contact Sungrow for technical evaluation if the grid-connected power exceeds 1.6MVA.

Scenario 2:

Several inverters are operated in parallel connection to low-voltage side of MV transformer. The high-voltage side of MV transformer is connected to the Middle Voltage Grid.

Requirements:

- Please contact Sungrow for technical evaluation if the grid-connected power exceeds 1.6MVA.
- The rate voltage on the low-voltage side of transformer must meet the inverter output electrical specification. A neutral point is necessary and must lead outwards as neutral conductor.



NOTICE

1MW transformer with a short-circuit impedance less than 6% is recommended.

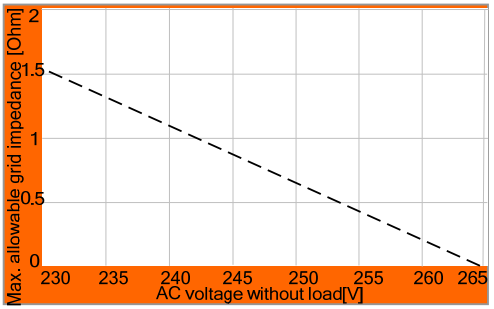
6.2.2 Grid Connection

An AC terminal block inside the connection cabinet is used for the five-wire grid connection (L1, L2, L3, N, PE) of the inverter. And feed-in power is always three-phase via the AC terminal.

AC Cable Requirements

Consider the following facts when select AC cables specifications and types:

- The grid impedance of the AC cable must correspond to the specification to avoid unintended disconnection from the grid or derating of the output power.



- Voltage drop and other consideration may use the larger size cables. Avoid power loss in cables of more than 1% of nominal inverter rating.
- Withstand ambient temperature;
- Layout type (inside wall, underground, free air etc.);
- UV resistance and so on.

Connecting Inverter to AC Grid

DANGER

Danger to human life due to high voltage existing inside the inverter!

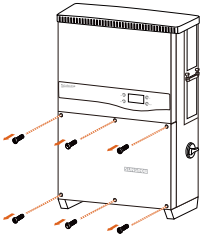
Make sure that all the DC and AC cables to the inverter are not live before you start the electrical work.

Do not turn on the AC side circuit breaker until all inverter electrical connections have completed.

Step 1 Disconnect AC circuit breaker and prevent it from reconnection inadvertently.

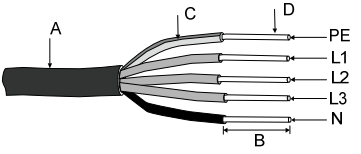
Step 2 Loose the six screws on the lower connection cabinet.

Step 3 Strip off AC cables as shown below.



For flexible cables (stranded wires), use cold pressing terminal lugs (plastic sleeves).

The cross-section of the AC cable conductor must be sized in order to prevent accidentally disconnections of the inverter from the grid due to high impedance of the cable that connects the inverter to the power supply point.



No.	Description	Remark
A	Protective layer	Accepted cable external diameter ranges from 37mm to 44mm.
B	Length of insulation to be stripped off	24 mm
C	Insulation layer	-
D	Cross section of AC cables	Range: 25-70mm^2; recommended value: 50 mm^2

The following table gives the recommended max. length of the AC cables based on the cross-section of the AC cables.

Cross-section of the AC cable (mm^2)	Max. length of the AC cables (m)
25	0-50
35	50-100
50	>100

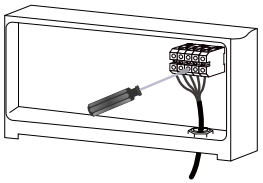
Step 4 Insert AC cables through cable gland from outside.

Step 5 Fix all cables ends to the corresponding terminals using a cross screwdriver according to markings on the block.

NOTICE

- **Observe the pin assignment of AC terminal block. If a phase wire is connected to the "PE" terminal, it may permanently destroy the inverter.**
- **Please avoid squeezing the cable insulation layer into the AC terminal. Improper connection may affect the normal operation of the inverter.**

Step 6 Screw cap nut tightly onto the cable.



*Images shown here is for reference only! Actual product you receive may differ.

***Supplement**

When the specification of AC cable protective layer you have selected is less than the recommended external diameter (37~44 mm), you need to wind the AC cable around by sealing strip in the form of spiral.

NOTICE

If the specification of AC cable protective layer is less than the recommended external diameter and no sealing strip is used, there may have moistures inside the inverter and unrecoverable damage the inverter.

The sealing strip is within the scope of delivery.

Step 1 Wind the AC cable around in the form of spiral

Wind the AC cable around for one or two layers according to the diameter of the protective layer.

External diameter of the AC cable	Number of layers	Length of the sealing strip winded around the AC cable
25mm~29.9mm	2	80mm~100 mm
30mm~36.9mm	1	80mm~100 mm

Use the sealing strip to wind the AC cable around in the form of spiral as shown in the Fig.6-2.

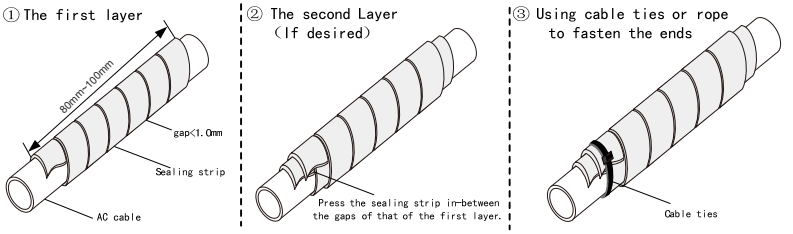


Fig. 6-2 Wind around the AC cable in the form of spiral

*Pictures here are indicatively only. The AC cable and sealing strip in kind prevail.

- Before winding, the surface of the AC cables that will be winded by sealing strip should be wiped clean.
- When you wind the second layer, please press the sealing strip in-between the gaps of that of the first layer.
- Please ensure there is no obvious gap of the spiral seams. The gap width should be less than 1.0mm.
- To prevent the sealing strip tilt, it is suggested to use cable ties or rope to fasten the ends of the sealing strip.
- When the diameter of AC cable protective layer is less than 25mm, you should wind the AC cable around for three layers.

Step 2 Insert the AC cable into the junction box, through the AC cable glands as shown in the Fig.6-3. The exposed length of sealing strip should be the half of the length that the sealing strip winded around the AC cable.

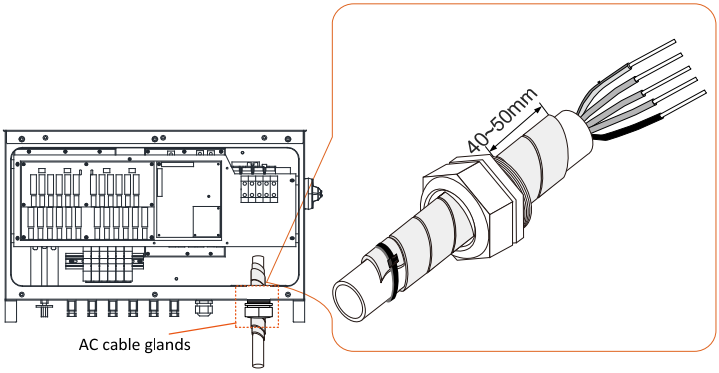


Fig. 6-3 Insert the AC cable into the junction box

6.3 Connecting Inverter to PV Arrays

DANGER

Lethal voltage exists!

PV arrays produce electrical energy when exposed to light and thus can create an electrical shock hazard.

WARNING

Make sure that the PV impedance to the ground is proper before connecting the PV array to the inverter.

6.3.1 PV Inputs Configuration

The SG50KTL-M inverter has four PV input areas DC1 input、DC2 input、DC3 input and 、DC4 input, each with its MPP tracker.

NOTICE

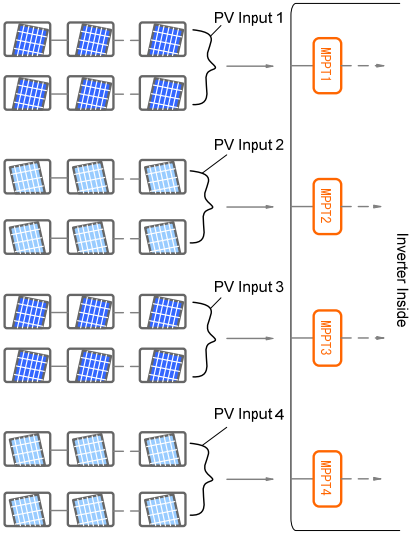
There is a risk of inverter damage! The following requirements should be met; otherwise they will lead to loss of any and all warranty rights.

- **Make sure that the maximum short circuit current of each DC input is less than inverter allowable limit.**

- **Make sure that the maximum open voltage of each string is less than 1000V. Voltage over 1000V can damage the inverter.**

The four PV inputs work independently, each with its own MPPT. Therefore the four PV inputs can be different with each other, including different PV module types, different numbers of connected in PV string, different tilt angles or orientation angle of PV modules.

As shown in the following diagram, the inverter should choose independent mode due to different orientation angle between the four PV inputs.



To make sure maximum DC power can be utilized, PV strings connected to individual input MPPT should have a homogenous structure, including the same type, the same number, identical tilt and identical orientation.

Prior to connecting the inverter to PV inputs, the following electrical specifications must be met simultaneously:

Total DC Power Limit	Open-circuit Voltage Limit for Each Input	Short-circuit Current Limit for Each Input
56.2KW	1000V	35A

Considering the negative voltage temperature coefficient of PV module, more attention should be paid to the open-circuit voltage of PV strings when designing at the lowest ambient temperature.

TakeYL250P-29bPV cells for example.

Item	Parameter
PV cell type	YL250P-29b
Power	250W
Open-circuit voltage (STC)	37.6V
Short-circuit current (STC)	8.92A
Open-circuit voltage temperature coefficient (β)	-0.32%/°C
No. of PV cells in a PV string	22

Under the STC condition, where ambient temperature is 25°C, the open-circuit voltage of PV cells is 37.6V×22=827.2V<1000V.

Supposed that the lowest temperature is -25°C, the open-circuit voltage of PV cells is 22×37.6V×[1+β×(min. ambient temperature- STC temperature)] = 22×37.6V×[1+(-0.32%/°C) ×(-25°C-25°C)]=952.4V<1000V (meet the operation requirement).

Therefore, PV string should be designed to meet the open-circuit voltage requirement even under the lowest ambient temperature condition.

6.3.2 PV Connection Procedures

DC cables from PV strings should be equipped with DC connectors.

Sungrow provides corresponding plug connectors in the scope of delivery for quick connection of PV inputs. Pairs of MC4 DC connectors are supplied in the scope of delivery.

To maintain IP65 weatherproof function of inverter, only the supplied DC connectors or the connectors of the same protection class can be used.

DC Cable Requirements

Tab. 6-1 DC Cable Requirements

Cross-section Area Range	Outer cable diameters	Max. Withstand Voltage	Max. input current for each PV string
4...6mm^2 12AWG…10AWG	6…9mm	1000V	10A

NOTICE

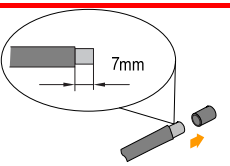
The input current of each input channel should be less than 12A, otherwise the fuse may blow out.

DC Cable Connection

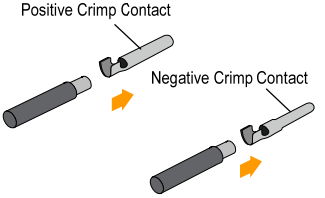
DANGER

Make sure that all the DC and AC cables to the inverter are not live before you start the electrical work.

Step 1 Strip off 7mm insulation layer from all DC cables.



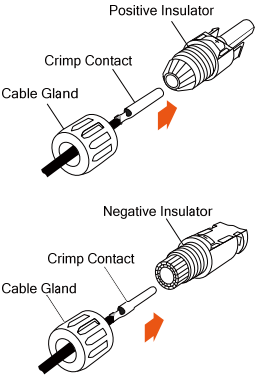
Step 2 Assemble cable ends with crimp contacts by crimping pliers.



Step 3 Lead cable through cable gland.

Step 4 Insert the crimp contact into the insulator until it snaps into place. Then pull gently to check if it is correctly engaged.

Step 5 Screw the cable gland to front insulator with tightening torque 2.5…3 N·m.



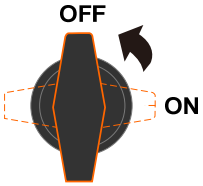
For further assembly and connection instruction, please visit the webpage of the device manufacturer.

Step 6 Make sure the connection cable of PV string for the correct polarity.

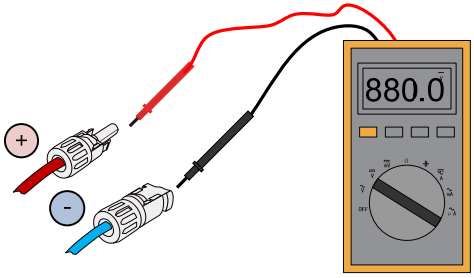
NOTICE

The inverter will not function properly if the DC polarities are reversed.

Step 7 Disconnect the DC switch.



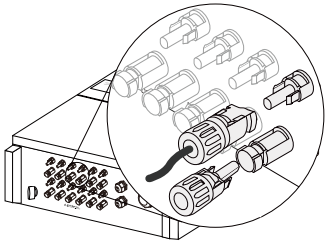
Step 8 Check the connection cable of PV string for the correct polarity and that the open-circuit voltage does not exceed the inverter input limit 1000V, even under the lowest operating temperature.

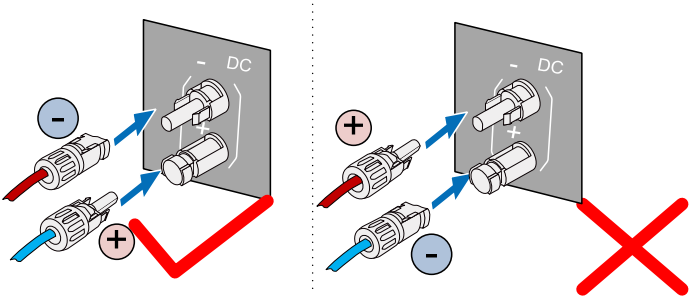


NOTICE

- **Check the positive and negative polarity of the PV cells. After confirmation, you can insert the DC connectors into the input terminals on the bottom of the inverter.**
- **For the same MPPT, reverse connection of a single string is prohibited. A permanent failure of the system or inverter may follow if otherwise.**

Step 9 Insert the positive and negative DC connectors into the input terminals on the bottom of the inverter until there is an audible sound.





Step 10 Connect other PV strings following the above-mentioned procedures.

Step 11 Seal the unused DC terminals with the waterproof plugs.

6.4 Grounding the Inverter

WARNING

Because of the transformer-less design of the inverter, neither the DC positive pole nor the DC negative pole of the PV string is permitted to be grounded.

6.4.1 Grounding System Overview

All non-current carrying exposed metal parts of the equipment and other enclosures in the PV power system should be grounded (e.g., PV arrays frame and inverter enclosure).

Where there is only one inverter in the PV power system, connect "PE" cable to the ground.

Where there are multiple inverters in the PV power system, connect "PE" cables of all inverters and mounting frame of PV arrays to the same copper bus bar. In this way, it will establish equipotential connection.

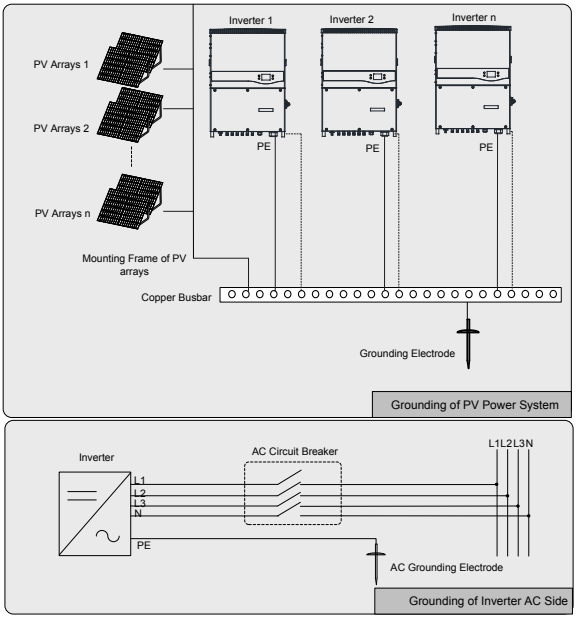


Fig. 6-4 Grounding for Inverter

6.4.2 Second Protective Earth Terminal

The inverter is equipped with second protective earth terminal as specified in EN 50178.

Second PE Terminals

There is a second PE terminal on one side of the inverter. Users may choose to connect PE connection.

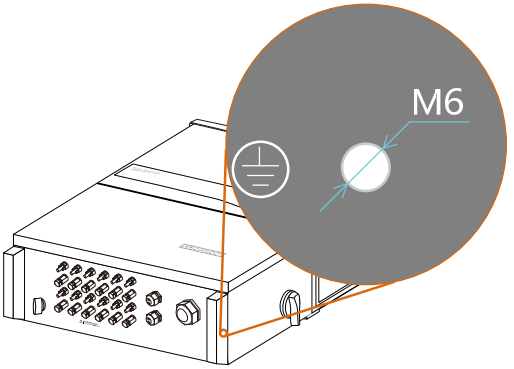
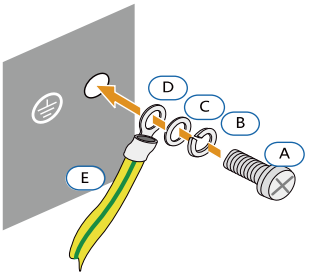


Fig. 6-5 Second PE Terminals

Second PE Connection



Item	Description	Remark
A	Screw	M6×12mm
B	Lock washer	-
C	Washer	-
D	Cable socket	-
E	Yellow-green cable	6mm^2(9AWG)

Fig. 6-6 Connection of the Second PE Connection

*The connection parts are not included in the delivery scope.

6.5 Communication Connection

6.5.1 Communication Overview

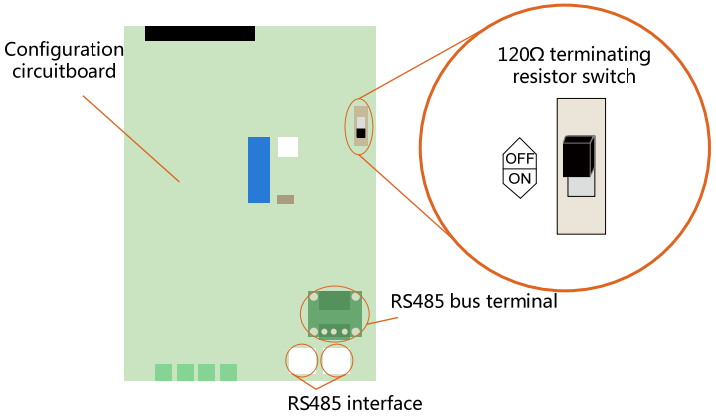
The inverter operation information can be transferred via its integrated RS485 interface to a PC with monitoring software (such as SolarInfo Insight), or to data logging device (such as SolarInfo Logger).

RS485 is the standard communication choice for inverter.

The communication terminals (RS485) are located at the bottom of the inverter. And there are two optional connection terminals on the configuration circuit board:

RS485 A/B terminal blocks and RJ45 plug in terminals.

If a 120Ω terminating resistor is to be connected between the communication cable A and B, connect the terminal resistance by using the dip switch.



Before communication connection, prepare communication cable and RJ45 plug.

NOTICE

RS485 cable's requirements to ensure quality of communication:

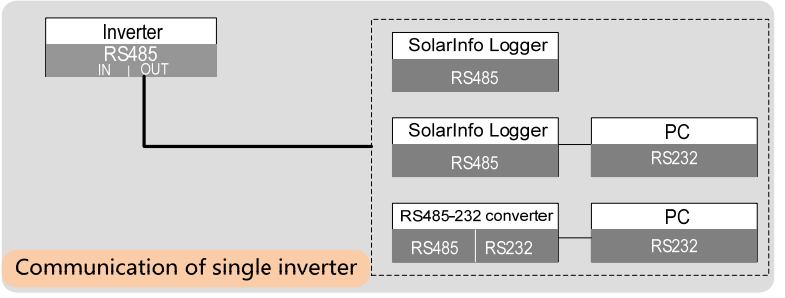
- **RS485 shielded twisted pair cables**
- **Shielded network cable**

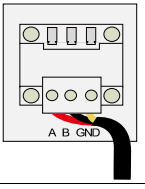
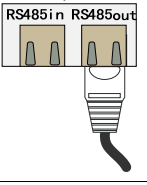
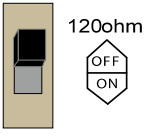
A converter such as RS485-232 converter or SolarInfo Logger, which converts 485 to 232 signal, is needed between inverter and PC.

6.5.2 Communication System

For Single Inverter

Where there is only one inverter, a RS485 cable enables connection between inverter and data logging device.

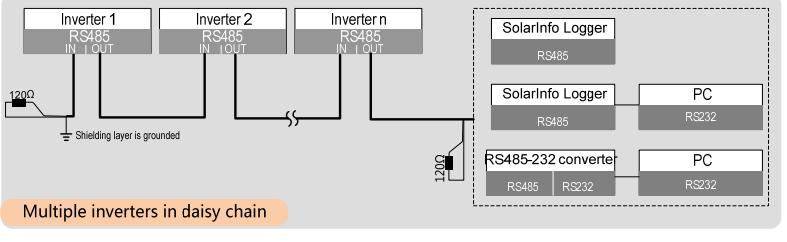


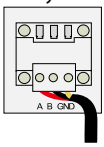
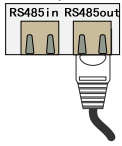
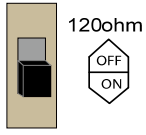
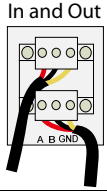
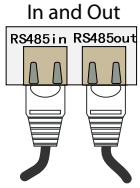
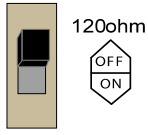
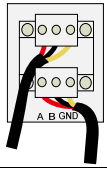
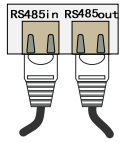
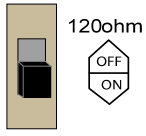
Inverter	Communication Connection (RS 485 A/B bus or RJ 45)		Terminating Resistor
	RS 485 A/B bus	RJ 45	
Single one	Only out. 	Only out. 	No 120ohm 

For Multiple Inverters

Where there is more than one inverter, all inverters can be connected to data logging device in daisy chain. The first and last inverters in the chain must be terminated with a resistor of 120Ω. The shielding layer of RS485 cable should be single-point grounded.

The maximum number that inverters are connected in the daisy chain depends on converter, data logging device and other factors. Please refer to converter's or data logging device's manual to obtain the limit no.



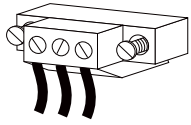
Inverter	Communication Connection (RS 485 A/B bus or RJ 45)		Terminating Resistor
	RS 485 A/B bus	RJ 45	
Inverter 1	Only out 	Only out 	Yes 
Inverter 2…n-1	In and Out 	In and Out 	No 
Inverter n	In and Out 	In and Out 	Yes 

6.5.3 RS485 Communication Connection

RS485A/B Bus Connection

Step 1 Lead the RS485 shielded twisted pair cables through the communication cable gland to the configuration circuit board.

Step 2 Trip off the insulating layer of the communication cables for approximately 7 mm. Connect the cables to the RS485 bus terminal blocks.



Step 3 According to the position of the inverter (refer to the prior section), repeat step 1…2 to connect the other RS485 cables.

Step 4 Pull cables outwards to confirm whether they are fastened firmly.

Step 5 According to the position of the inverter (refer to the prior section) switch ON

or OFF the terminating resistor.

Step 6 Tighten the tread-lock sealing lock. Block off the vacant terminals to protect the inverter's internal from dust and moisture.

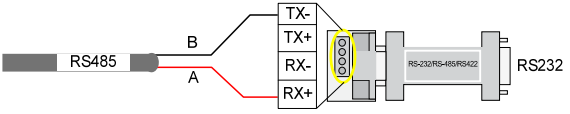
Step 7 If there is no other connection procedure, recover and fix the front cover of the connection cabinet.

Step 8 Now perform RS485 communication connection as the diagram shown above. Connect the other end of cable to other devices. Communication terminal definition is referred to device manual.

Step 9 Verify the communication connection and configure the communication parameters.

If there is more than one inverter to communicate with a PC or a data logger, it is crucial to configure the communication parameters of each inverter. See "10.12 Communication Parameters Setting".

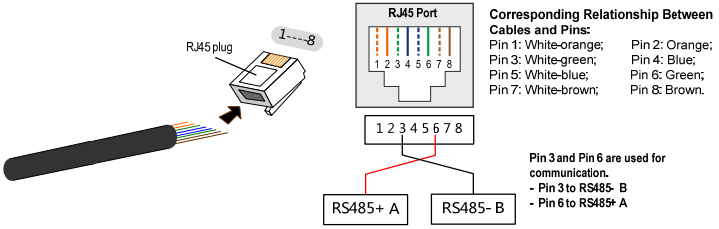
SolarInfo logger and RS485-232 converter are optional parts and can be ordered from Sungrow.



RJ45 Connection

Step 1 Lead Network cable through communication cable gland to the configuration circuit board.

Step 2 Use the Ethernet crimper to crimp the cables and connect cables to RJ45 plug according to TIA/EIA 568B.


RJ45 plug
1----8
RJ45 Port
1 2 3 4 5 6 7 8
Corresponding Relationship Between Cables and Pins:
Pin 1: White-orange;
Pin 2: Orange;
Pin 3: White-green;
Pin 4: Blue;
Pin 5: White-blue;
Pin 6: Green;
Pin 7: White-brown;
Pin 8: Brown.
1 2 3 4 5 6 7 8
Pin 3 and Pin 6 are used for communication.
- Pin 3 to RS485- B
- Pin 6 to RS485+ A
RS485+ A
RS485- B

Step 3 Connect the RJ45 plug into the RS485 in/RS485 out terminal on the configuration circuit board.

Step 4 According to the position of the inverter (refer to the prior section), repeat step1…3 to connect the other Network cables to the RS485 out/RS485 in terminal on the configuration circuit board.

Step 5 Pull cables outwards to confirm whether they are fastened firmly.

Step 6 Tighten the tread-lock sealing lock. Block off the vacant terminals to protect the inverter's internal from dust and moisture.

Step 7 According to the position of the inverter (refer to the prior section) switch ON or OFF the terminating resistor.

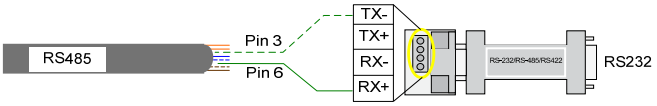
Step 8 If there is no other connection procedure, recover and fix the front cover of the connection cabinet.

Step 9 As for the wires which connect to the logging devices, use the Ethernet wire stripper to strip the insulation layer and connect the RS485 A and B cables (3 and 6) to data logging device or RS485-232 converter. Communication terminal definition is referred to the device manual.

Step 10 Verify the communication connection and configure the communication parameters.

If there is more than one inverter to communicate with a PC or a data logger, it is crucial to configure the communication parameters of each inverter. See "10.12 Communication Parameters Setting".

SolarInfo logger and RS485-232 converter are optional parts and can be ordered from Sungrow.



6.5.4 Ethernet Connection

Connect the inverter to PC through network ports to set up Ethernet communication.

Ethernet communication can be connected either in single, daisy chain or star topology.

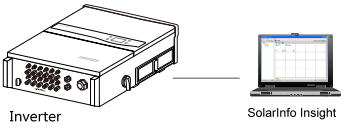


Fig. 6-7 Direct network connection of single inverter

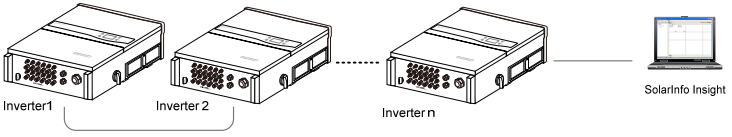


Fig. 6-8 Direct network connection of multiple inverters

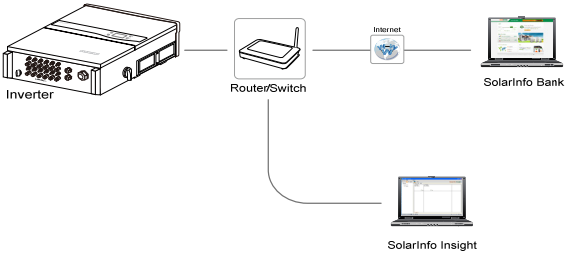


Fig. 6-9 Single inverter network connection

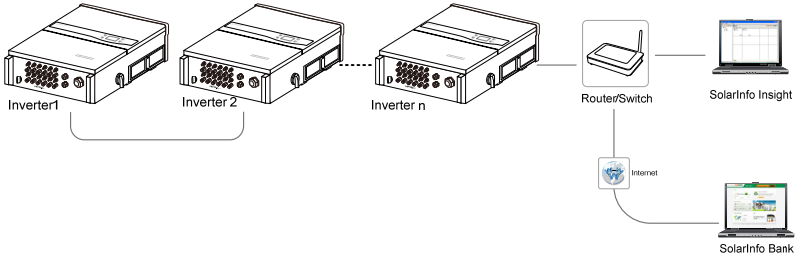


Fig. 6-10 Multiple inverters network connection in daisy chain topology

The network communication of the daisy chain is done via the inverter in-built switching chip. Therefore, when the inverter is damaged, the switching chip cannot work normally and the daisy chain communication will be interrupted.

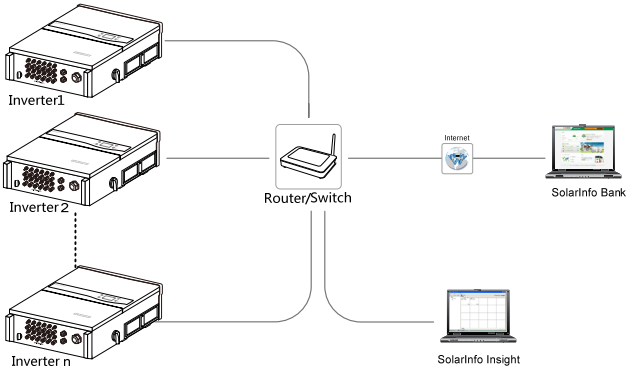


Fig. 6-11 Communication connection in star topology

The maximum number that inverters are connected in the daisy chain depends on converter, data logging device and other factors. Please refer to the manual of converter or data logging device to obtain the limit number.

- The network cable should be less than 100m.

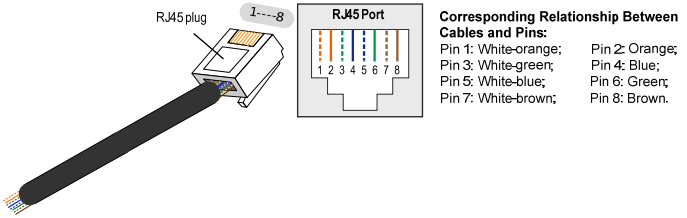
NOTICE

Only qualified personnel can set or change Ethernet related parameters.

Ethernet Connection Procedure

Step 1 Lead Network cable through communication cable gland to the configuration circuit board.

Step 2 Use the Ethernet crimper to crimp the cables and connect cables to RJ45 plug according to TIA/EIA 568B.



Step 3 Connect the RJ45 plug into the NET in/NET out terminal on the configuration circuit board.

Step 4 According to the position of the inverter (refer to the prior section), repeat

step1…3 to connect the other RS485 cable to the NET in/NET out terminal.

Step 5 Pull cables outwards to confirm whether they are fastened firmly.

Step 6 Tighten the tread-lock sealing lock. Block off the vacant terminals to protect the inverter's internal from dust and moisture.

Step 7 If there is no other connection procedure, reassemble and fix the front cover of the connection cabinet.

Step 8 For the wires which connect to logger or switch, use the Ethernet wire stripper to strip the insulation layer and connect the cable cores to RJ45 plug and then connect to other devices. Refer to other manuals and documents if there are other devices.

Step 9 Confirm the communication connection and set the communication parameters.

If more than one inverter is connected to PC or Logger, please set the communication parameters from the LCD display. For more information, please refer to "10.12 Communication Parameter Setting".

7 Commissioning

Commissioning is a critical part for a well-installed PV system, which can protect against fires, injury and electrical shock.

7.1 Inspection before Commissioning

Before starting the inverter, you should check the following items.

1. Inverter unit is accessible for operation, maintenance and service.
2. Re-check that the inverter is firmly installed onto the wall.
3. Space for ventilation well is provided for one inverter or more than one inverter.
4. Nothing is left on the top of the inverter unit.
5. Inverter and accessories are correctly connected.
6. Cables are routed in safe place or protected against mechanical damage.
7. Specification of AC circuit breaker is reasonable.
8. Terminals not used underneath the inverter are sealed.
9. Warning signs & labels are suitably affixed and durable.

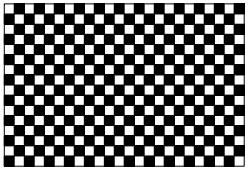
7.2 Commissioning Procedure

If all checking items mentioned above meet the requirements, precede the following procedures to start up the inverter for the first time.

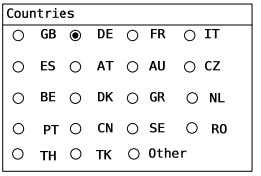
Step 1 Close external AC circuit breaker.

Step 2 Rotate DC switch to "ON" position.

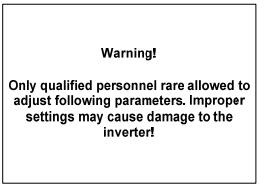
Step 3 Suppose there are sufficient sunlight and enough DC power. PV arrays initialize and supply DC power to inverter. The LCD display is activated to check the validity first. If there is a defect on the display, contact Sungrow.



Step 4 **Press** ▼ to choose country code. Confirm the settings by **Pressing ENTER**.



Step 5 Select the country code according to the inverter's installation country. Each country code represents corresponding local protective parameters that have been preset before delivery. Before country setting, there is warning screen.

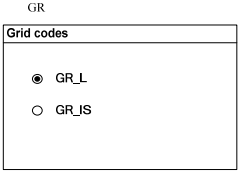

Warning!
Only qualified personnel rare allowed to adjust following parameters. Improper settings may cause damage to the inverter!

Refer to "10.11 Protection Parameter Setting" for country code explanation. If the inverter is installed where the country code is not included, please choose item "Other" and manually set the protective parameters.

⚠ CAUTION

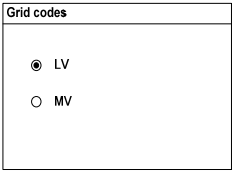
If the country code is not set correctly during commissioning, reset the protective parameters as dictated in "10.11 Protection Parameter Setting". There may be faults if otherwise.

Step 6 If the country code set as GR, a Grid codes page as shown in the right will appear. **Press** ▼ to select grid code and press ENTER to confirm.



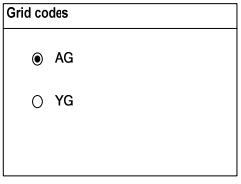
If the country code set as DE, a Grid codes page as shown in the right will appear, where LV signifying low-voltage grid; MV signifying medium-voltage grid. **Press** ▼ to select grid code and **press ENTER** to confirm.

DE



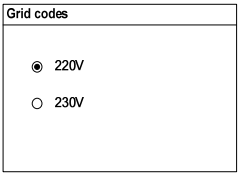
If the country code set as TK, a Grid codes page as shown in the right will appear. **Press** ▼ to select grid code and **press ENTER** to confirm.

TK



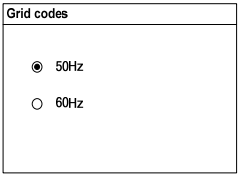
If the country code set as TH, a Grid codes page special for Thailand will appear. **Press** ▼ to select grid code and **press ENTER** to confirm.

TH



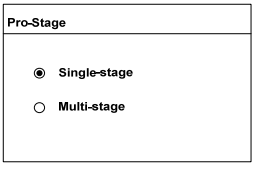
If the country code set as Other, a Grid codes page as shown in the right will appear. **Press** ▼ to select grid code and **press ENTER** to confirm.

Other

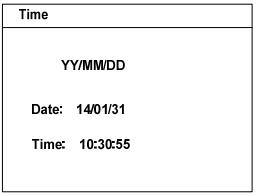


Step 7 If the country selected is not the abvementioned 5 countries, enter the next step directly.

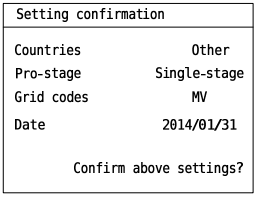
Step 8 After selecting the Grid Code, there will be a "Pro-stage" type selection screen and then corresponding sub-menu will come up. For detailed information, please refer to "Protective Parameters Setting".



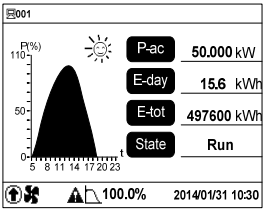
Step 9 Set the inverter time as per local time. Incorrect time setting will affect the data logging. **Press** ▼ to move the cursor and **Press** ▼ to set the specific time and date. **press ENTER** to confirm setting.



Step 10 After configuring all parameters, there will be a "setting confirmation" screen. Check whether all above-mentioned parameters are correct. Confirm by **press ENTER**. Cancel by Pressing ESC and reset.



Step 11 Inverter will enter into startup process. Observe the status of LED indicators and the LCD main screen. If commissioning succeeds, the "RUN" indicator will be on d "Run" will be displayed on the "State" area.



If commissioning fails, the "FAULT" indicator will be on and "Fault" will occur on the display. **Press** ▼ to view "current fault" information. Remove the existing fault and then repeat the commissioning procedures.

8 Disconnecting, Dismantling and Disposing the Inverter

8.1 Disconnecting the Inverter

For maintenance work or any service work, inverter must be switched off. In normal operation, switching off is not necessary.

In order to disconnect the inverter from the AC and DC power sources, you should proceed as follows. Otherwise you will be exposed to lethal voltages or the inverter will be damaged.

Step 1 Disconnect the external AC circuit breaker and prevent it from reconnecting.

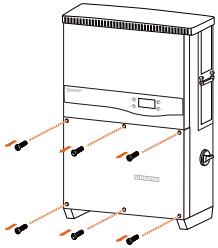
Step 2 Turn off the upstream DC circuit break or or pull off the MC4 terminal. Rotate DC switch at the side of inverter to the "OFF" position.

NOTICE

Please strictly follow the sequence of the above procedures. Inverter will not work normally if otherwise.

Step 3 Wait about ten minutes until the capacitors inside the inverter have discharged.

Step 4 Loose the six screws on the lower connection cabinet and then remove the lid.



Step 5 Measure AC voltage to ground at the AC terminal to confirm AC output of inverter at the AC circuit breaker is voltage free.

Step 6 Loose screws to remove AC cables.

Step 7 Disconnect DC cables from the inverters.

8.2 Dismantling the Inverter

Refer to Chapter 5 and Chapter 6 to dismantle the inverter in reverse steps.

NOTICE

If the inverter will be reinstalled in the future, please refer to 4.4 Storage of Inverter for a proper conservation.

8.3 Disposing the Inverter

Users should take the responsibility for the disposal of the inverter.

NOTICE

Some parts and devices in the inverter, such as the LCD display, batteries, capacitors, may cause environment pollution. Users must comply with the related local regulations to avoid pollution.

9 Troubleshooting and Maintenance

9.1 Troubleshooting

9.1.1 Troubleshooting of LED Indicator

See "Tab. 2-2 Description of LED Indicator Status" for definition of LED's states.

Type of fault	Troubleshooting
LED indicators and LCD screen cannot be lit	1. Disconnect AC side circuit breaker. 2. Rotate DC switch to the "OFF" position. 3. Check the polarity of DC input.
"RUN" indicator goes out	1. Disconnect AC side circuit breaker. 2. Rotate DC switch to the "OFF" position. 3. Check the correctness of electrical connection of inverter. See "6 Electrical Connection". 4. Check whether DC input voltage exceeds the inverter start voltage of inverter. 5. If all above conditions are OK, please contact with Sungrow.
"Fault" indicator is lit	1. A fault is not removed yet. 2. Perform troubleshooting in according to fault type in LCD screen. See "9.1.2 Troubleshooting of Faults in LCD Screen". 3. If it cannot be solved, please contact Sungrow.
"RUN" indicator is blinking	1. Warning fault occurs of the inverter. 2. Perform troubleshooting in according to fault type in LCD screen. See "9.1.2 Troubleshooting of Faults in LCD Screen". 3. If it cannot be solved, please contact Sungrow.

9.1.2 Troubleshooting of Faults in LCD Screen

When faults occur, "Fault" state will be shown on the main screen. Press ▼ to view multiple "current fault" information pages.

Fault Code	Description	Troubleshooting
002	The grid voltage exceeds inverter allowable upper limit.	1. Check the voltage of the grid. 2. If the grid voltage exceeds the permissible range of inverter protection parameters, ask utility grid company for solution. 3. If the grid voltage is within the permissible range, contact Sungrow Service Dept..
003	Grid transient voltage exceeds the permissible range	1. This is a short-term fault due to grid condition. Wait a moment for inverter recovery. 2. If the fault still exists, please contact Sungrow Service Dept..
004	The grid voltage is below inverter's allowable lower limit.	1. Check the grid voltage. 2. If the grid voltage exceeds the permissible range of inverter protection parameters, ask utility grid company for solution. 3. If the grid voltage is within the permissible range, contact Sungrow Service Dept..
005	The grid voltage is too low.	1. This is a short-term fault due to grid condition. Wait a moment for inverter recovery. 2. If the fault still exists, please contact Sungrow Service Dept..
006	The AC output current exceeds inverter protection limit.	1. The inverter will resume if the output current falls below the protection value. 2. If the fault still exists, please contact Sungrow Service Dept..
007	Transient AC overcurrent	The inverter will self-recover after several seconds.
008	The grid frequency exceeds inverter allowable upper limit.	1. Check the grid frequency. 2. If the grid frequency exceeds the permissible range of inverter protection parameters, ask utility grid company for solution. 3. If the grid frequency is within the permissible range, contact Sungrow Service Dept..
009	The grid frequency is below the inverter allowable lower limit.	
010	Islanding	1. Check whether AC circuit breaker is triggered. 2. Check whether AC cables are all firmly connected. 3. Check whether grid is not in service. 4. If all conditions are OK and this fault still occurs in the LCD screen, contact Sungrow Service Dept..

Fault Code	Description	Troubleshooting
011	The DC component of AC current exceeds inverter limit.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
012	A failure current is detected.	1. Check the PV strings for ground fault. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
013	Grid abnormal is detected	1. Wait a moment for grid recovery. 2. If the grid parameters exceed the permissible range, ask utility grid company for solution. 3. If the grid frequency is within the permissible range, contact Sungrow Service Dept..
014	The average grid voltage exceeds the permissible range for over 10 minutes.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
015	Grid impedance exceeds inverter's limit	1. Check the model of the AC cables. 2. Wait a moment for inverter recovery. 3. If the fault occurs repeatedly, contact Sungrow Service Dept..
016	The AC output overloads.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
017	Unbalance between the three phase voltages is detected	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
019	The transient bus voltage is high.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
020	The bus voltage is high.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
021	PV1 or PV2 input overcurrent is detected	Check the layout and the wiring of PV1 or PV2 input.
022	PV3 or PV4 input overcurrent is detected	Check the layout and the wiring of PV3 or PV4 input.
023	PV configuration mode has changed during inverter running.	Check the PV input configuration mode and restart the inverter when necessary.
024	Deviation from neutral point voltage is detected.	1. Inverter will recover if the deviation value falls below the protection limit. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..

Fault Code	Description	Troubleshooting
025	Transient unbalance of neutral point voltage is detected	1. Inverter will recover if the deviation value falls below the protection limit. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
026	Bus fluctuation voltage is high.	1. This is a short-term fault. Wait a moment for inverter recovery. 2. If the fault still exists, please contact Sungrow Service Dept..
036	The temperature of module is too high	1. Check whether AC output power exceeds the nominal power. 2. Check the functionality of the fans and whether there are some abnormal fans. Please replace broken fan if necessary. 3. Clean air outlet grills. 4. If the fault still exists, please contact Sungrow.
037	The ambient temperature is too high	
038	Relay fault is detected	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
039	The insulation resistance is low. (ISO-flt)	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
040	AC or DC overcurrent fault, or DC overvoltage fault.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
041	Sampling channel failure	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
042	Current imbalance.	If the fault occurs repeatedly, contact Sungrow Service Dept..
043	The ambient temperature falls below -25°C	Disconnect and stop the inverter. Wait for ambient temperature to rise above -25 ℃ and then restart inverter.
044	There is a fault with DC/AC inversion circuit	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
047	The PV configuration mode set on the display is not in accordance with the configuration in the connection cabinet.	1. Disconnect the inverter. 2. Re-select PV configuration mode and re-connect PV strings. For more detailed information please refer to "6.3 Connecting Inverter to PV Arrays".
048	Phase-R current sampling channel fault.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
049	Phase-S current sampling channel fault.	

Fault Code	Description	Troubleshooting
050	Phase-T current sampling channel fault.	
051	Hardware Overvoltage/ Overcurrent protection	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
070	Fans are defective.	Disconnect inverter and remove the broken fan.
072	Fault with DC SPD	It is necessary to replace the DC SPD. Contact Sungrow Service Dept..
073	Fuse has blown out	Disconnect the inverter and replace the fuses. Contact Sungrow Service Dept..
074	Communication fault of LCD	A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid. Contact Sungrow Service Dept..
075	Solar irradiation is not sufficient for inverter operation.	1. Wait for higher irradiation. 2. If this recurs at medium irradiation, check the PV system design and correct the connection of PV inputs.
076	PV overload	Check the PV system design and correct the connection of PV inputs.
078	PV1 power abnormal warning	Check the PV1 input for disconnection or looseness. If the warning fault still exists, please contact Sungrow
079	PV2 power abnormal warning	Check the PV2 input for disconnection or looseness. If the warning fault still exists, please contact Sungrow
080	PV3 power abnormal warning	Check the PV3 input for disconnection or looseness. If the warning fault still exists, please contact Sungrow
081	PV4 power abnormal warning	Check the PV4 input for disconnection or looseness. If the warning fault still exists, please contact Sungrow
087	There is a fault with the AFD block.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
088	Arcing warning	Check the associated circuit and press ENTER to remove the fault.
089	AFD disable warning	Remove the fault by reactivating the AFD function on the LCD screen.

Fault Code	Description	Troubleshooting
532-547	Reverse polarity warning of PVS connection.	1. Check the polarity of the PV inputs, if the polarity is reverse, please reconnect PV strings. 2. If the fault still exists, please contact with SUNGROW.
548-563	The output current of the PVS is obviously abnormal.	1. Check whether the PV array is shielded. If the PV array is clear and is not shielded, check whether the PV modules are faulty. 2. Check the DC input cable for disconnection. If so, reconnect the cable and reset the PVS function. 3. If the fault still exists, please contact with SUNGROW.

9.2 Maintenance

9.2.1 Routine Maintenance

Items	Methods	Period
System clean	Check the temperature and dust of the inverter. Clean the inverter enclosure. Check the humidity and dust of the environment. Meanwhile check whether the filter function of the air inlet is ok. Clean the air inlet and outlet, when necessary.	Six months to a year (it depends on the dust contents in air.)
Fans	Check whether there is crack of the fan blade Check whether there is any abnormal noise of the fan. Clean or replace the fans.	Once a year
Devices check	Check the fuses and the DC SPD. Replace the fuse. Contact Sungrow to order new DC SPDs.	Every 6 months

9.2.2 Maintenance Instruction

Fans' Maintenance

There are four fans at the side of the inverter for active cooling during running operation. If the fans are dirty or out of work, the inverter may not be well cooled down and its efficiency may accordingly decrease. Therefore it is necessary to clean the dirty fans or replace the broken fans.

DANGER

- **Disconnect the inverter from the grid first and then PV arrays before any maintenance work.**
- **Lethal voltage still exists in the inverter. Please wait for at least ten minutes and then perform maintenance work.**
- **Fans' maintenance work may only be performed by qualified electricians.**

Step 1 Disconnect the AC circuit breaker.

Step 2 Turn off the upstream DC circuit break or pull off the MC4 terminal. Rotate DC switch at the side of inverter to the "OFF" position.

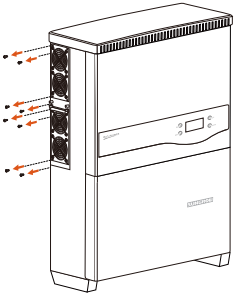
Step 3 Wait for at least ten minutes.

Step 4 Disconnect all electrical connection in the reverse procedures in the "6 Electrical Connection".

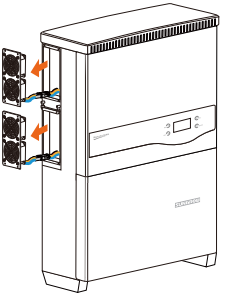
Step 5 Lift up the inverter over the backplate with the help of others and then remove it from the wall.

Step 6 Place the inverter onto the platform.

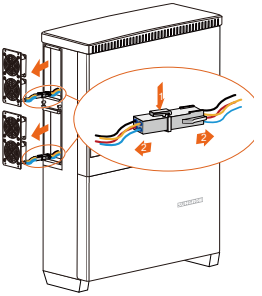
Step 7 Loosen the screws as shown in the right diagram.



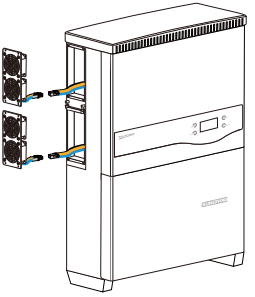
Step 8 Disassemble the metal plate slightly.



Step 9 Release the locking part of four connectors by pressing on the ribbing of the locking hooks and pull outwards.



Step 10 Remove fans from the inverter.



Step 11 You can clean the dirty fans with soft brush or vacuum cleaner. Or replace the broken fans.

Step 12 Re-assemble the fans onto the inverter.

Step 13 Connect the four connectors and fasten them with cable ties.

Step 14 Assemble the plate by fastening the four screws.

Step 15 Perform the electrical and mechanical connection and then restart the inverter.

Replacing the String Fuses

For optional version inverter, it is necessary to replace the blown string fuses due to overcurrent.

Step 1 Disconnect AC circuit breaker.

Step 2 Turn off the upstream DC circuit break or pull off the MC4 terminal. Rotate DC switch at the side of inverter to the "OFF" position.

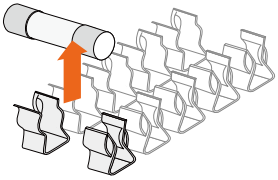
Step 3 Wait for at least ten minutes.

Step 4 Open the inverter as described in section "8 Disconnecting, Dismantling and Disposing the Inverter".

Step 5 Observe the string fuse assignment and check the fuse conductivity using the multimeter. A non-conductive fuse indicates a fault in the affected string.

Step 6 Check the affected string by installer of the PV generator and replace the defective string fuse with same specification (order from Sungrow).

Step 7 Remove the blown string fuse.



Step 8 Insert the new fuse into the fuse holder.

Step 9 Close the inverter and startup the inverter again.

Clean Air Inlet and Outlet

A huge amount of heat is generated in the process of running the inverter. The inverter adopts a controlled forced-air cooling method.

In order to maintain good ventilation, please check whether there is anything blocking the air inlet and outlet.

Clean the air inlet and outlet with soft brush or vacuum cleaner if necessary.

9.3 Contact Sungrow Service

Should you have any problems in operating on the inverter, please contact us:

Service hotline: +86 551 65327817

Email: service@sungrow.cn

We need the following information to provide you the best assistance:

- Type of the inverter
- Serial number of the inverter
- Fault code/name
- Brief description of the problem

10 Operation of LCD Display

10.1 Description of Button Function

Inverter offers two buttons for user to look up the running information and configure parameters. The two buttons have multiple functions. Please refer to Tab. 10-1 before any operation onto inverter.

Tab. 10-1 Button function

Button	Operation	Description
ESC	Press for less than 2 seconds	Move upwards or downwards or scroll among set values. Hereinafter, it is referred to as "Press ∨".
	Press for more than two seconds	Return to the previous menu or cancel the command. Hereinafter, it is referred to as "Press **ESC**".
ENTER	Press for less than 2 seconds	Move left or right, or turn pages. Hereinafter, it is referred to as "Press >".
	Press for more than two seconds	Enter into the sub-menu or confirm the command. Hereinafter, it is referred to as "Press **ENTER**".

If there is no button operation for:

- 1 minute, LCD backlight is OFF;
- 2 minutes, system returns to the default menu (main screen).

10.2 Inverter Menu Structure

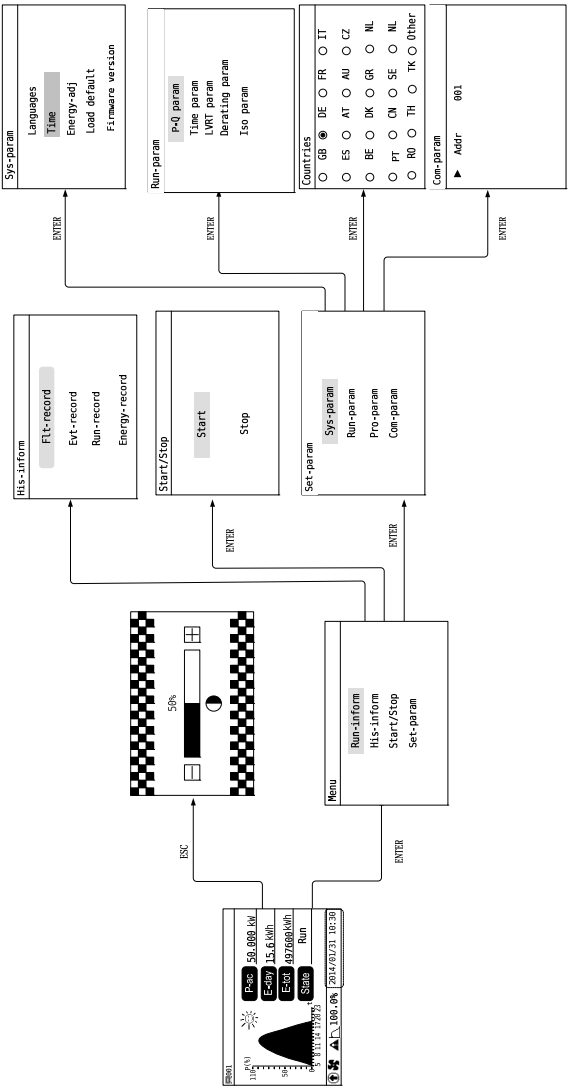


Fig. 10-1 Menu Tree-English

10.3 Main Screen

Once the inverter commissioning is finished, LCD display will enter the main screen as shown in Fig. 10-2.

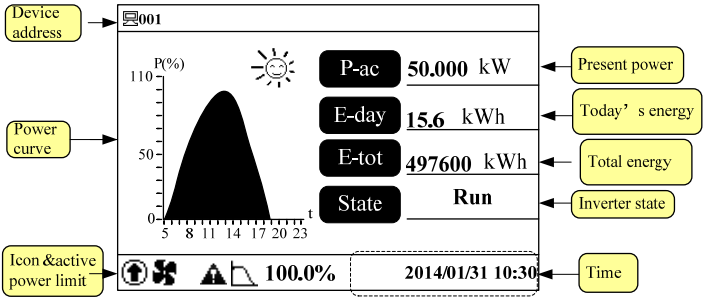
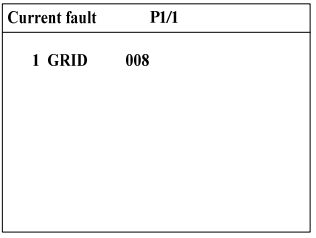


Fig. 10-2 Main screen

Tab. 10-2 Description of the main screen

State	Description
Run	After being energized, inverter tracks the PV arrays' maximum power point (MPP) and converts the DC power into AC power. This is the normal operation mode.
Standby	Inverter enters Standby mode when DC side input is insufficient. In this mode inverter will wait within the Standby duration (set by user, refer to 10.10.1 Main Screen of Run-param).
Stop	Inverter is stopped.
Key-stop	Inverter will stop operation by manual "stop" through LCD menu. In this way, inverter internal DSP stops. To restart the inverter, manually start from the LCD menu.
Start...	The inverter is initializing and synchronizing with the grid.
Upd-fail	IAP upgrade failure
Fault	If a fault occurs, inverter will automatically stop operation, disconnect the AC relay, and display the fault information on the LCD display with the "FAULT" indicator on. Once the fault is removed in recovery time (set by user, refer to 10.10.1 Main Screen of Run-param), inverter will automatically resume running.
Warning	Warning information is detected.

If inverter is in "Fault" state, press ➤ or ➘ to view "Current fault" information. To know the meaning of the fault code, please refer to" 9.1.2 Troubleshooting of Faults in LCD Screen".

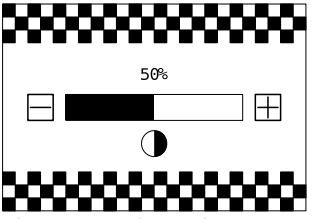


Tab. 10-3 Icon Description

Icon	Description
	Inverter is in IAP update process.
	Inverter in power derating state.
	Fans inside are working.
	Inverter is operating in warning state.

10.4 Adjust Contrast

Step 1 Press **ESC** to enter into the contrast adjustment screen.



Step 2 Press ˅ to increase the setting value and press ˃ to decrease the value.

Step 3 Press **ENTER** to confirm the contrast setting.

Contrast adjustment range: 0…100%

Recommended value: 50% or 60%.

10.5 Checking Running Information

The main screen displays some basic information about the inverter. For more detailed information, please operate as follows:

Main Screen (Press ENTER)→**Menu**→**Run-inform** (Press ENTER)

LCD display will show the detailed running information. Scroll pages by pressing ➤ /⮟.

DC power input: the total PV input power.
Vdc[V]: DC voltage of each input.
Idc[A]: DC current of each input.
Pdc[W]: DC power of each input.

DC power input			00000W
	Vdc[V]	Idc[A]	Pdc[W]
DC1	500.0	5.0	2500
DC2	500.0	5.0	2500
DC3	500.0	5.0	2500
DC4	500.0	5.0	2500

Vac[V]: Phase voltage.
Iac[A]: Phase current.
Pac[W]: AC output of each phase.
F[Hz]: Frequency of each phase.

	L1	L2	L3
Vac[V]	230.0	230.0	230.0
Iac[A]	6.0	6.0	6.0
Pac[W]	0000	0000	0000
F[Hz]	00.00	00.00	00.00

CO_2-reduce: Total CO_2 emission reduction due to the inverter.
E-month: The energy generated in this month.
h-Total: Total running hours of the inverter.
T-today: Inverter running time today.
Temp: Internal temperature of the inverter.
ISO: Insulation resistance to the ground of the input side.

CO_2-reduce	6kg
E-month	10kWh
h-Total	1h
T-today	63min
Temp	25.0°C
ISO	20000kΩ

P-W: Inverter output active power.
S-Va: Inverter output apparent power.
Country: Inverter selected country code.
Grid code: Inverter selected grid code (note: if country selected is DE, grid code here is LV or MV; country selected is TH, grid code here is 220V or 230V; country selected is TK, grid code here is AG or YG; country selected is Other, grid code here is 50Hz or 60Hz).

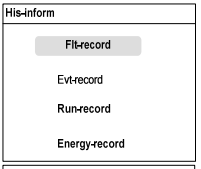
P-W	100W
S-Va	130VA
Country	DE
Grid code	LV

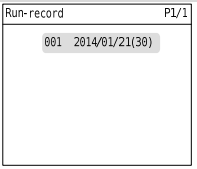
10.6 Checking History Information

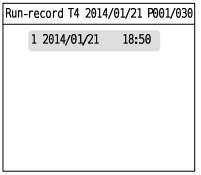
10.6.1 Checking Running Records

Main Screen (Press ENTER)→**Menu** (Press ▼, Press ENTER)→**His-inform** (Press ▼×2, Press ENTER)→**Run-record** (Press ENTER)

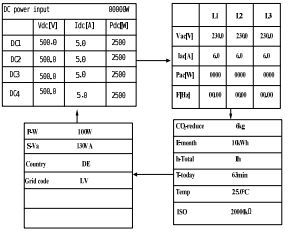
On the "Run-record" interface, scroll pages by pressing➤, and press ▼ to select the date you want to view. Confirm by pressing **ENTER**.







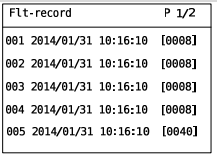
LCD display shows the running records. Press ➤ to turn pages and press ▼ to view the records of the selected date.



10.6.2 Checking Fault Records

Main Screen (Press ENTER)→**Menu** (Press ▼, Press ENTER)→**His-inform** (Press ENTER)→**Flt-record** (Press ENTER)

On the "Flt-record" interface, scroll pages forwards by pressing➤, and press ▼ to scroll pages backwards.

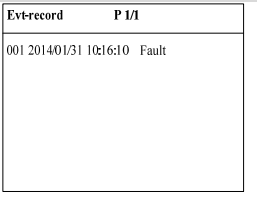


The inverter can only store at most 100 latest fault records.

10.6.3 Checking History Event Records

Main Screen (Press ENTER)→**Menu** (Press ▼, Press ENTER)→**His-inform**(Press ▼, Press ENTER)→**His-event** (Press ENTER)

On the "Evt-record" interface, scroll pages forwards by pressing➤, and press ▼ to scroll pages backwards.

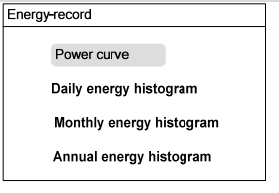


The inverter can only store at most 100 latest fault records.

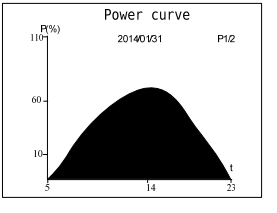
10.6.4 Checking Energy Records

Main Screen (Press ENTER)→**Menu** (Press ▼, Press ENTER)→**His-inform**(Press ▼, Press ENTER)→**Energy-record** (Press ENTER)

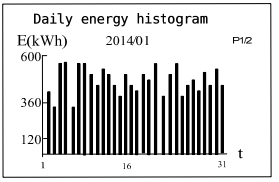
LCD display shows the energy records. User can view various energy records by pressing ▼: power curve, daily energy histogram, daily energy histogram, monthly energy histogram, and annual energy histogram.



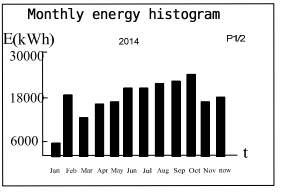
Power curve: shows the power output from 5am to 11pm in a single day. Each point in the curve is the percentage of present power and nominal power. Press ➤ or ▼ to view the power curve of the latest 7 days.



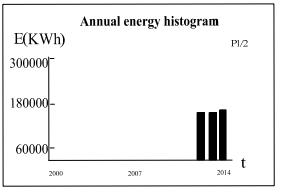
Daily energy histogram: shows the power output every day in the present month. Press ➤ or ▼ to view the daily energy of the latest 12 months.



Monthly energy histogram: shows the power output every month in a year. Press ➤ or ▼ to view the monthly energy of the latest 15 years.



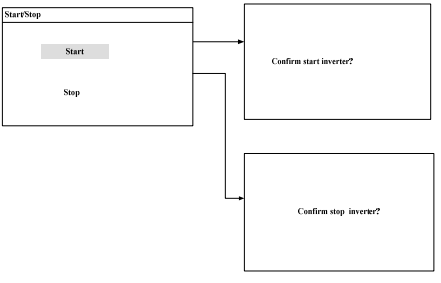
Annual energy histogram: shows the power output every year. Press ➤ or ▼ to view the annual energy of the latest 90 years.



10.7 Starting/Stopping

Main Screen (Press ENTER)⟶Menu (Press ▼×2)⟶Start/Stop (Press ENTER)

Press ▼ to choose "Start"/"Stop" and **press ENTER** to confirm the choice.



Press ENTER to confirm.

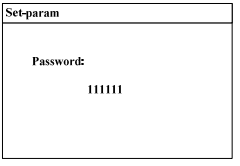
10.8 Password Entry

Parameter setting is password-protected. To set the parameters, you should enter the correct password.

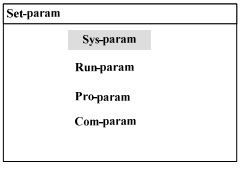
Step 1 **Press** ENTER to enter the Menu screen.

Step 2 **Press** ▼ to move the cursor to "Set-param" item and confirm by **pressing** ENTER.

Step 3 A password confirmation screen will occur. **Press** ➤ to move cursor right and **Press** ▼ to input the password 111111.



Step 4 **Press** ENTER to confirm the password and enter the "Set-param" sub menu.



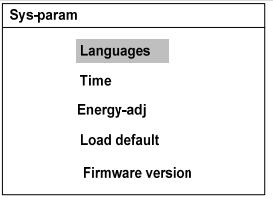
10.9 System Parameter Setting

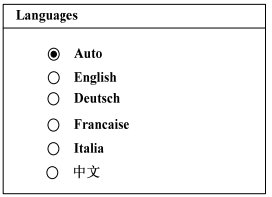
There are various user settable system parameters. You can set the system parameters after entering the correct password.

10.9.1 Language Setting

Main Screen (Press ENTER)→Menu (Press ▼×3) →Set-param (Press ENTER)→Enter password (Press ENTER)→Sys-param (Press ENTER, Press ▼)→Languages (Press ENTER)

If Auto is selected for languages, the inverter system language will be the language of the country selected



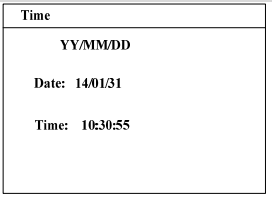


10.9.2 Time Setting

Time deviation between the time on the inverter and the local time of the installation site may cause data logging failure. Please adjust inverter time according to the local time.

Main Screen(Press ENTER)→Menu (Press ▼×3)→Set-param(Press ENTER)→Enter password (Press ENTER)→Sys-param(Press ENTER, Press ▼)→Time(Press ENTER)

Press ➤ to move the cursor and press ▼ to change value. Press **ENTER** to confirm setting.

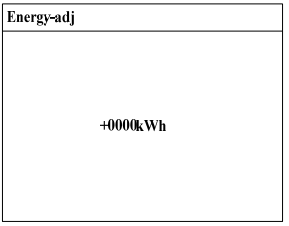


10.9.3 Total Energy Deviation Adjustment

If the accumulative value "E-total" in the inverter is different from the value in the external metering device, you should adjust energy by "Energy-adj" setting.

Main Screen(Press ENTER)→Menu (Press ▼×3)→Set-param(Press ENTER)→Enter password (Press ENTER)→Sys-param(Press ENTER, Press ▼×2)→Energy-adj(Press ENTER)

Press ➤ to move the cursor and press ▼ to change value. Press **ENTER** to confirm setting.
The positive symbol "+" can be changed to the negative symbol "-".
The adjustment range is from -9999 to +9999 kWh.
(Energy-adj value)= (Real measured value) - (E-tot reading value).



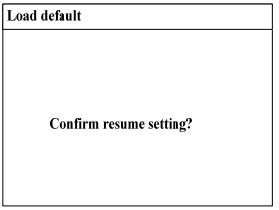
10.9.4 Load Default

NOTICE

All history information will be unrecoverable cleared and all parameters will return to the default value except the protective parameters and time once the "load default" operation is performed.

Main Screen (Press ENTER)→Menu (Press ▼×3)→Set-param(Press ENTER)→Enter password (Press ENTER)→Sys-param(Press ENTER, Press ▼×3)→Load default (Press ENTER)

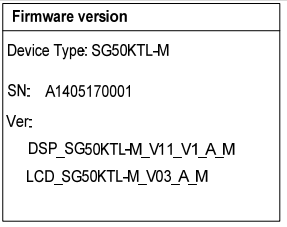
Press **ENTER** to confirm "load default".



10.9.5 Checking Firmware Version

Main Screen (Press ENTER)→Menu (Press ▼ ×3)→Set-param(Press ENTER)→Enter password (Press ENTER) → Sys-param(Press ENTER, Press ▼×4) → Firmware version(Press ENTER)

Inverter shows detailed firmware information, including LCD version and DSP version.
The firmware version information is read only.

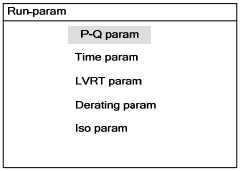


10.10 Running Parameter Setting

10.10.1 Main Screen of Run-param

Main Screen (Press **ENTER**)→**Menu** (Press ▼ ×3)→**Set-param** (Press **ENTER**)→**Enter password** (Press **ENTER**, Press ▼)→**Run-param** (Press **ENTER**)

On the "Run-param" screen, press ▼ to select one item and press **ENTER** to enter the setting interface. For each item, **Press** ➤ to move the cursor and **Press** ▼ to set the appropriate value.
Confirm settings by Pressing **ENTER**.



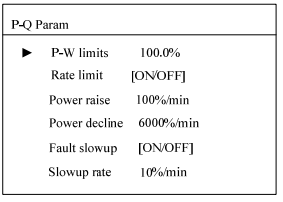
Tab. 10-4 Description of Running Parameters

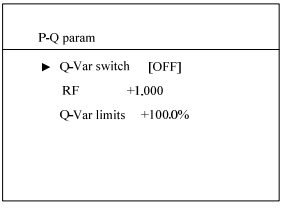
	Parameter	Description	Default	Range
P-Q param	P-W limits	Inverter active power limitation	100.0%	0~100%
	Rate limit	Set the active power change rate. When it is set to [ON], user can set the raise and decline rate.	[OFF]	[OFF]/ [ON]
	Power raise	When Rate limit is ON, set the active power rise rate.	100%/min	8~100%/min
	Power Decline	When Rate limit is ON, set the active power decline rate.	6000%/min	8~6000%/min
	Fault slowup	Set the power rise rate when a fault is removed. When it is ON, the active power raise rate can be set.	[ON]	[OFF]/ [ON]
	Slowup rate	Set the active power raise rate.	100%/min	8~100%/min
	Save P-W Setting	Whether to save the active power setting	[OFF]	[OFF]/ [ON]
	Save Q-Var setting	Whether to save the reactive power setting	[ON]	[Pt]/[Qt]/ [Off] / [Q(P)] / [Q(U)]
	Q-Var witch	Set the reactive power regulation function	[OFF]	[OFF]/ [ON]
	PF	Inverter output power factor	+1.000	-1.000~-0.800/ +0.800~+1.000
	Q-Var limits	Inverter reactive power limitation	0.0%	0~+100%/ 0~-100%
Time param	Standby time	Time from inverter standby to startup	20s	20~255s
	Recover time	Time from inverter fault is removed to standby	30s [IT: 300s]	0-900s

	Parameter	Description	Default	Range
	LVRT param	Set the LVRT to OFF or ON. When it is ON, inverter can keep grid-connection for a certain time when grid fault occurs and provide reactive power for grid recovery.	[OFF]	[OFF]/ [ON]
	Derating param	Set the Derating param to OFF or ON. If it is ON, inverter will operate with power derating when grid frequency exceeds the set value.	[OFF]	[OFF]/ [ON]
Iso param	ISO	Set the ISO protection function to ON or OFF. When it is ON, inverter will not connect to the grid when resistance to the ground is below the set value.	[ON]	[OFF]/ [ON]
	ISO pro value	Set the resistance to the ground.	200KΩ	-

10.10.2 Active/Reactive Power Parameters

Main Screen (Press **ENTER**)→**Menu** (Press ▼ ×3)→**Set-param** (Press **ENTER**)→ **Enter password** (Press **ENTER**, Press ▼)→**Run-param** (Press **ENTER**) →P-Q Param (Press **ENTER**)





10.10.3 Reactive Power Regulation

Inverter provides reactive power regulation function. Use the "***Q-Var switch***" parameter to activate this function and select proper regulation mode.

Tab. 10-5 Explanation of reactive power regulation switch

Regulation Mode	Explanation
Pf	The reactive power can be regulated by the parameter *PF (Power Factor)*.
Qt	The reactive power can be regulated by the parameter *Q-Var limits* (in %).
Off	The *PF* is limited to +1.000, and the "*Q-Var limits*" is limited to 0.0%.
Q(P)	The PF changes with the output power of the inverter.
Q(U)	The reactive power changes with the grid voltage.

"Pf" Mode

The reactive power can be regulated by the parameter *PF* on the Run-param screen.

"Qt" Mode

The reactive power can be regulated by the parameter *Q-Var limits (in %)* on the Run-param screen.

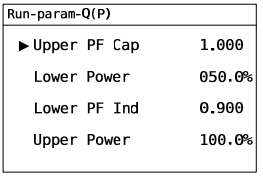
"Off" Mode

Reactive power cannot be regulated. The *PF* is limited to +1.000, and the *Q-Var limit* is limited to 0.0%.

"Q(P)" Mode(when the country selection is not "IT")

PF changes with the inverter output power.

If the country selection is not "IT" (Italy), after selecting Q(P) Mode, **Press** ▼to enter the Run-param-Q(P) submenu.
For each item setting, **Press** ➤ to move cursor and **Press** ▼ to set the appropriate value. Confirm settings by Press **ENTER**.



Tab. 10-6 "Q(P)" Mode Parameters Explanation

Parameter	Explanation	Default	Range
Upper PF Cap	Power factor of point P1 in the Q(P) mode curve	1	0.9~1
Lower Power*	Output power of point P1 in the Q(P) mode curve (in %)	50%	0%~50%

Parameter	Explanation	Default	Range
Lower PF Ind	Power factor of point P2 in the Q(P) mode curve	0.9	0.9~1
Upper Power*	Output power of point P2 in the Q(P) mode curve (in %)	100%	50%~100%

* Lower Power < Upper Power

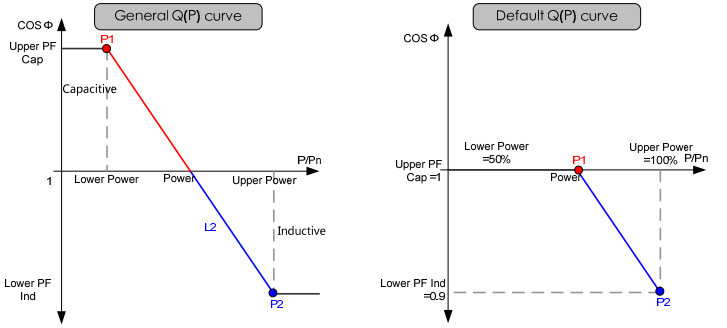
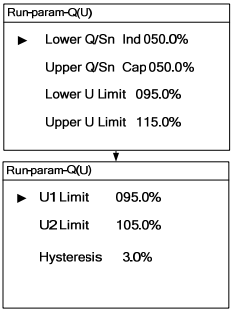


Fig. 10-3 Reactive Power Regulation Curve in Q(P) Mode

"Q(U)" Mode(when the country selection is not "IT")

The reactive power ratio changes with the grid voltage.

If the country selection is not "IT" (Italy), after selecting Q(U) mode, **Press** ▼ to enter the Run-param-Q(U) submenu.
For each item setting, **Press** ➤ to move cursor and **Press** ▼ to set the appropriate value.
Confirm settings by Pressing **ENTER**.



Tab. 10-7 "Q(U)" Mode Parameters Explanation

Parameter	Explanation	Default	Range
Lower Q/Sn Ind	Inductive Q/Sn value of point P4 in the Q(U) mode curve	25%	0%~50%
Upper Q/Sn Cap	Capacitive Q/Sn value of point P1 in the Q(U) mode curve	25%	0%~50%
Lower U Limit	Grid voltage limit *(in %)* of point P1 in the Q(U) mode curve	80%	80%~90%
Upper U Limit	Grid voltage limit *(in %)* of point P4 in the Q(U) mode curve	115%	110%~115%

Parameter	Explanation	Default	Range
U1 Limit*	Grid voltage limit *(in %)* of point P2 in the Q(U) mode curve	95%	95%~100%
U2 Limit*	Grid voltage limit *(in %)* of point P3 in the Q(U) mode curve	105%	100%~105%
Hysteresis*	Hysteresis voltage width (in %)	3%	0%~5%

* U1 Limit + Hysteresis < U2 Limit - Hysteresis

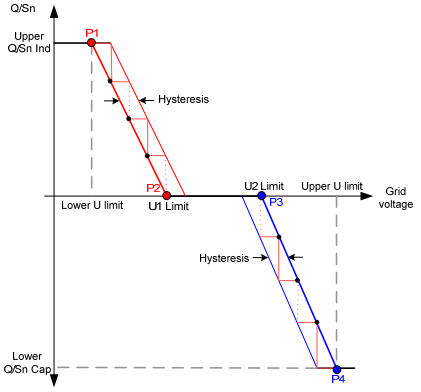


Fig. 10-4 Reactive Power Regulation Curve in Q(U) Mode

10.10.4 Reactive Power Setting for Italy

If the "Countries" selected is "IT" (Italy), several LCD menus and operation methods are different from other countries.

The differences focus on "Run-param" as shown below.

Italy "Q(P)" Mode

Power factor changes with the output power of the inverter.
Select Q(P) mode and **Press** ▼ to enter into the "Run-para-Q(P)" sub-menu.
Press ▼ to move the cursor; **Press** ➤ to enter the editing mode, then the selected parameter will be shaded.
Press ▼ to increase one-step value; **Press** ➤ to decrease one-step value.
Press ENTER to confirm the setting and exit from the editing mode.

Run-param-Q(P)	P3/3
▶ PA	020.0%
PB	050.0%
PC	100.0%
Pf max	0.900
Uin	105.0%
Uout	100.0%

Tab. 10-8 Italy "Q(P)" Mode Parameters Explanation

Parameter	Explanation	Default	Range	Step
PA*	Active power at point A (in %)	20%	20~100%	1%
PB*	Active power at point B (in %)	50%	20~100%	1%
PC*	Active power at point C (in %)	100%	20~100%	1%
Pf max	Power factor at point C	0.9	0.9~1	0.01
Uin**	Enter Q(P) regulation mode when grid voltage is above Uin	105%	100~110%	1%
Uout**	Exit from the Q(P) regulation mode when grid voltage is below Uout	100%	90~100%	1%

*PA < PB≤ PC ** Uin > Uout

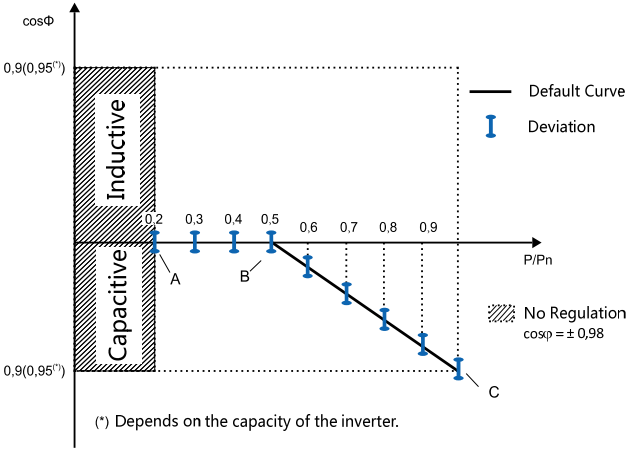


Fig. 10-5 Reactive Power Regulation Curve in "IT" Q(P) Mode

Italy "Q(U)" Mode

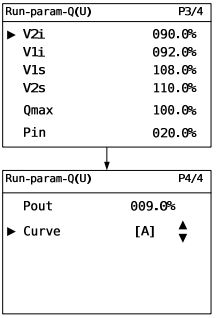
The reactive power ratio changes with the grid voltage.

Select Q(U) mode and **Press** ▼ to enter the "Run-para-Q(U)" sub-menu.

Press ▼ to move the cursor; **Press** ➤ to enter the editing mode, then the selected parameter will be shaded.

Press ▼ to increase one-step value; **Press** ➤ to decrease one-step value.

Press ENTER to confirm the setting and exit from the editing mode.



Tab. 10-9 Italy "Q(U)" Mode Parameters Explanation

Parameter	Explanation	Default	Range	Step
V2i*	Grid voltage at point D (in %)	90%	90~110%	1%
V1i*	Grid voltage at point C (in %)	92%	90~110%	1%
V2s*	Grid voltage at point A (in %)	108%	90~110%	1%
V1s*	Grid voltage at point B (in %)	110%	90~110%	1%
Qmax	The max. ratio of reactive power (in %)	90%	50~100%	1%
Pin**	Enter the Q(U) regulation mode when power is above Pin	20%	20~100%	1%
Pout**	Exit from the Q(U) regulation mode when power is below Pout	9%	1~20%	1%
Curve	Curve type	A	A/B	-

*V2i < V1i < V1s < V2s **Pin > Pout

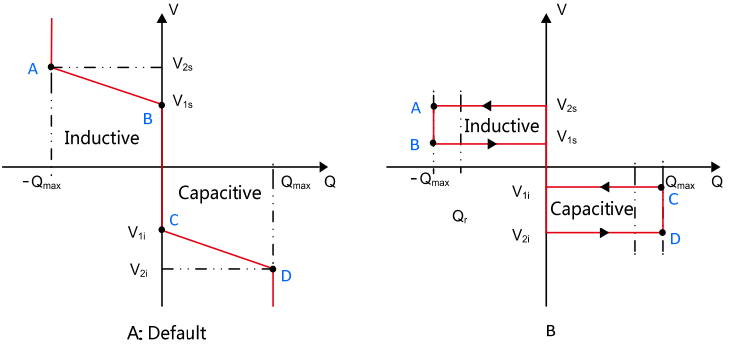
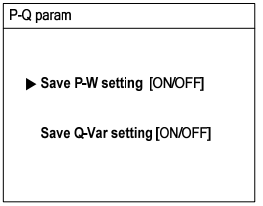


Fig. 10-6 Reference Reactive Power Regulation Curve in "IT" Q(U) Mode

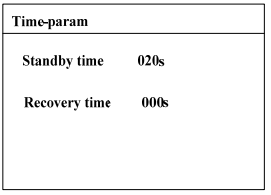
10.10.5 Save P/Q-set

On the "Save P/Q-set" screen, Press ▼ to move arrow to one item, Press ➤ to move cursor and Press ▼ to set.
Confirm by Pressing ENTER.
Select "ON" to save the values set after power down.
Select "OFF" to restore default values ater power down.



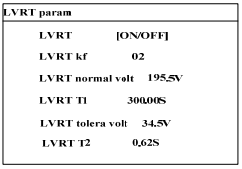
10.10.6 Time Parameters

Main Screen (Press **ENTER**)→**Menu** (Press ▼ ×3)→**Set-param**(Press **ENTER**)→ **Enter password** (Press **ENTER**, Press ▼)→**Run-param** (Press **ENTER,** Press ▼)→ **Time-param** (Press **ENTER**)



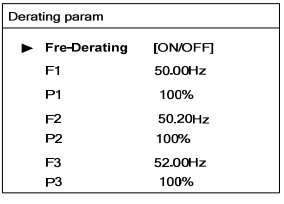
10.10.7 LVRT Parameter

Main Screen (Press **ENTER**)→**Menu** (Press ▼ ×3)→**Set-param**(Press **ENTER**)→ **Enter password** (Press **ENTER**, Press ▼)→**Run-param** (Press **ENTER,** Press ▼×2)→ **LVRT param** (Press **ENTER**)



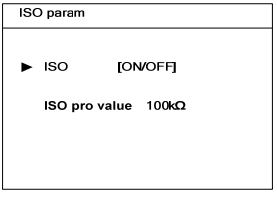
10.10.8 Derating Parameters

Main Screen (Press **ENTER**)→**Menu** (Press ▼ ×3)→**Set-param**(Press **ENTER**)→ **Enter password** (Press **ENTER**, Press ▼)→**Run-param** (Press **ENTER,** Press ▼×3)→ **Derating param** (Press **ENTER**)



10.10.9 ISO Parameters

Main Screen (Press **ENTER**)→**Menu** (Press ▼ ×3)→**Set-param**(Press **ENTER**)→ **Enter password** (Press **ENTER**, Press ▼)→**Run-param** (Press **ENTER,** Press ▼×4)→ **ISO param** (Press **ENTER**)



10.11 Protection Parameter Setting

Protection parameters are designed for the threshold value that can trigger the protection function of the inverter.

Main Screen (Press ENTER)→Menu (Press ▼×3)→Set-param (Press ENTER)→Enter

password (Press ENTER, Press ▼×2)→Pro-param (Press ENTER)

Press ➤ to move cursor and Press ▼ to input the password.

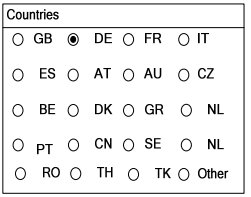
User can only check the parameter in this interface. To set the protection parameter, please contact Sungrow to acquire advanced password.

10.11.1 Country Setting

To make the protection parameters setting convenient, inverter provides in-built protection parameters for certain countries.

Press ▼ to choose countries and press ENTER to confirm.

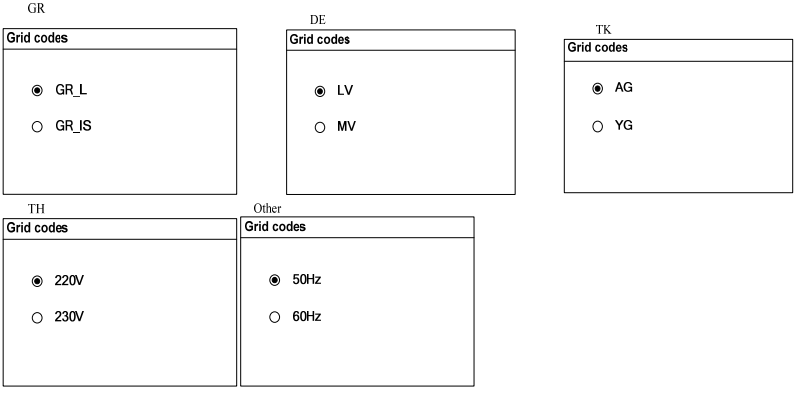
If the country selected is not in the list, please choose Other and then input the protection parameters manually.



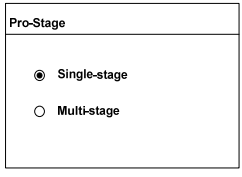
Tab. 10-10 Country code description

Country Code	Country	Language
GB	Great Britain	English
DE	Germany	German
FR	France	French
IT	Italy	Italian
ES	Spain	English
AT	Austria	German
AU	Australia	English
CZ	Czech	English
BE	Belgium	French
DK	Denmark	English
GR	Greece	English
NL	Netherlands	English
PT	Portugal	English
CN	China	Chinese
SE	Sweden	English
RO	Romania	English
TH	Thailand	English
TK	Turkey	English
Other	Country not mentioned above	English

When the country selected is TH, TK, DE, GR or Other, the grid code specific to them will appear on the LCD display as shown below. Press ▼ to choose grid code and press **ENTER** to confirm.



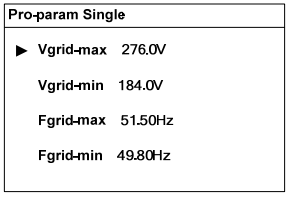
If country selected is not the five countries mentioned above, you need not to choose grid code. The Pro-Stage interface will appear. You may choose Single-stage or Multi-stage. Press ▼ to choose single-stage or Multi-stage and press **ENTER** to confirm.



10.11.2 Single-stage Protection Parameter Setting

The following interfaces will appear if Single-stage is selected.

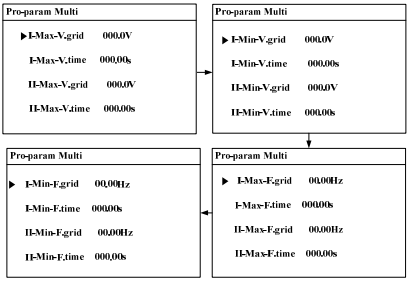
Press ▼ to select parameter, **Press** ➤ to move cursor and **Press** ▼ to set the appropriate value. Confirm settings by Pressing **ENTER**.



10.11.3 Multi-stage Protection Parameter Setting

The following interfaces will appear if Multi-stage is selected.

Press ▼ to select parameter, **Press** ➤ to move cursor and **Press** ▼ to set the appropriate value. Confirm settings by Pressing **ENTER**.

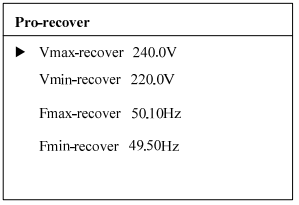


Tab. 10-11 Multi-stage Protection Parameters Explanation

Parameter	Explanation
Max-V. prot	Over-voltage protection
Ⅰ-Max-V. grid	Stage Ⅰ Grid over-voltage (U>)
Ⅰ-Max-V. time	Stage Ⅰ Grid over-voltage (U>) tripping time
Ⅱ-Max-V. grid	Stage Ⅱ Grid over-voltage (U>>)
Ⅱ-Max-V. time	Stage Ⅱ Grid over-voltage (U>>) tripping time
Min-V. prot	Under-voltage protection
Ⅰ-Min-V. grid	Stage Ⅰ Grid under-voltage (U<)
Ⅰ-Min -V. time	Stage Ⅰ Grid under-voltage (U<) tripping time
Ⅱ-Min -V. grid	Stage Ⅱ Grid under–voltage (U<<)
Ⅱ-Min -V. time	Stage Ⅱ Grid under–voltage (U<<) tripping time
Max-F. prot	Over-frequency protection
Ⅰ-Max-F. grid	Stage Ⅰ Grid over-frequency (f>)
Ⅰ-Max-F. time	Stage Ⅰ Grid over-frequency (f>) tripping time
Ⅱ-Max-F. grid	Stage Ⅱ Grid over-frequency (f>>)
Ⅱ-Max-F. time	Stage Ⅱ Grid over-frequency (f>>) tripping time
Min-F. prot	Under-frequency protection
Ⅰ-Min-F. grid	Stage Ⅰ Grid under-frequency (f<)
Ⅰ-Min -F. time	Stage Ⅰ Grid under-frequency (f<) tripping time
Ⅱ-Min -F. grid	Stage Ⅱ Grid under-frequency (f<<)
Ⅱ-Min -F. time	Stage Ⅱ Grid under-frequency (f<<) tripping time

10.11.4 Protection Recovery Setting

After setting the protection parameters, inverter enters protection recovery interface.

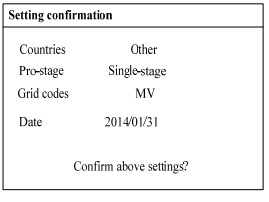


Tab. 10-12 Description of protection recovery parameters

Parameter	Explanation
Vmax-recover	Max. protection recovery voltage
Vmin-recover	Min. protection recovery voltage
Fmax-recover	Max. protection recovery frequency
Fmin-recover	Min. protection recovery frequency

10.11.5 Protection Parameter Confirmation

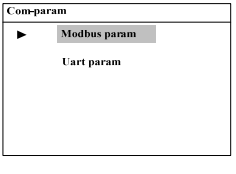
The setting confirmation interface will appear once the protection parameters are input. Press **ENTER** to confirm the parameter selection and press **ESC** to reset the protection parameters.



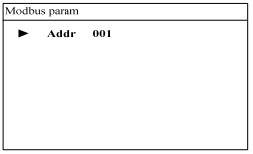
10.12 Communication Parameter Setting

Main Screen (Press ENTER)→Menu (Press ▼ ×3)→Set-param (Press ENTER)→Enter password (Press ENTER, Press ▼×3)→Com-param (Press ENTER)

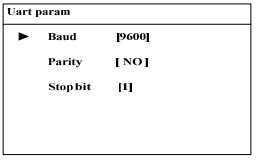
Press ➤ to move cursor and press ▼ to set the appropriate value. Confirm settings by Pressing **ENTER**.



Device address range: 1-247.



Baud rate can be set to 9600bps or 19200bps.
Parity can be set to NO, ODD or EVEN.
Stop bit can be set to 1b or 2b.



11 Appendix

11.1 Technical Data

Parameters	SG50KTL-M
Input Side Data	
Max. PV input power	52000W
Max. PV input voltage	1000V
Startup voltage	300V
Nominal input voltage	620V
MPP voltage range	300…850V
MPP voltage range for nominal power	500...850V
No. of MPPT(s)	4
Max. number of PV strings per MPPT	12
Max. PV input current	26Ax4
Max. input current for input connector	28Ax4
Short-circuit current of PV input	32Ax4
Output Side Data	
Nominal AC output power	50000W
Max. AC output apparent power	55000VA
Max. AC output current	80A
Nominal AC voltage	3/N/PE, 400Vac
AC voltage range	310...450Vac (May vary as per corresponding country's grid standard.)
Nominal grid frequency	50Hz
Grid frequency range	47~53Hz (May vary as per corresponding country's grid standard.)
THD	< 3 % (at nominal power)
DC current injection	<0.5%In
Power factor	>0.99 default value at nominal power (adj. 0.8 overexcited...0.8 underexcited)
Protection	
SVG	Optional
Anti-islanding protection	Yes
LVRT	Yes

Parameters	SG50KTL-M
AC short circuit protection	Yes
Leakage current protection	Yes
DC switch	Integrated
DC fuse	Integrated
Overvoltage protection	Type II DIN rail surge arrester
System data	
Max. efficiency	98.9%
Max. European efficiency	98.5%
Stand-by power	20W
Isolation method	Transformerless
Ingress protection rating	IP65
Night power consumption	<1W
Operating ambient temperature range	-25... + 60℃ (>45℃ derating)
Allowable relative humidity range	0...100%, no condensing
Cooling method	Smart forced air cooling
Max. operating altitude	4000m (>3000m derating)
Display	Graphic LCD
Communication	RS485 (RJ45 connector)
Certification	VDE0126-1-1, EN62109-1, EN62109-2,G59/2, CEI-021, AS/NZS 3100, AS4777.2, AS4777.3, VDE-AR-N-4105, BDEW, CGC-SOLAR.
Mechanical Data	
Dimensions (W×H×D)	677×962×282.5mm
Mounting method	Wall bracket
Weight	70kg

11.2 Exclusion of Liability

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- Installing or operating the product in an unintended environment
- Ignoring relevant safety regulations in the deployment location when installing or operating the product

- Ignoring safety warnings and instructions contained in all documents relevant to the product
- Installing or operating the product under incorrect safety or protection conditions
- Altering the product or supplied software without authority
- The product faults due to operating attached or neighboring devices beyond allowed limit values
- Damages caused by irresistible natural environment

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- Using the SolarInfo software for commercial purposes is prohibited.
- Decompiling, decoding or destroying the original program, including SolarInfo software and the embedded software, is prohibited.

11.3 About Us

Sungrow power supply is a China-leading manufacturer of various power electronics products for renewable energy generation systems. Our products include converters, inverters, battery chargers and other power supplies for distributable generation system in both grid-connected and stand-alone applications. The power rating of Sungrow products covers from hundred watt to mega-watt systems.

The vision of Sungrow is to help our customers acquire stable and clean power with minimum cost, maximum reliability and enhanced safety.

Contact Information

Should you have any question about this product, please contact us.

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